**DOCUMENT RESUME**

ED 148 577 SE 023 290

| | |
|---|---|
| AUTHOR | Geissler, Dennis; Larson, Richard |
| TITLE | Individualized Geometry: A Geometry Unit for the Intermediate Grades. |
| INSTITUTION | Wisconsin Univ., Eau Claire. |
| PUB DATE | 77 |
| NOTE | 161p.; For related documents, see SE 023 286-291; Not available in hard copy due to copyright restrictions; Contains occasional colored pages which may not reproduce well |
| AVAILABLE FROM | Dr. Juanita Sorenson, University of Wisconsin-Eau Claire, Library 1109, Eau Claire, Wisconsin 54701 ($6.00) |
| EDRS PRICE | MF-$0.83 Plus Postage. HC Not Available from EDRS. |
| DESCRIPTORS | *Activity Learning; Curriculum; Elementary Education; *Elementary School Mathematics; *Geometric Concepts; *Individualized Instruction; *Instructional Materials; Intermediate Grades; Teacher Education; Units of Study |
| IDENTIFIERS | Individually Guided Education; *Wisconsin |

ABSTRACT

This geometry unit for the intermediate grades is based on the Holt Mathematics Series (levels 3-6), using the concepts of Individually Guided Education (IGE). It is divided into seven levels, one for grade 3 and two each for grades 4-6. Each is designed for both individual and group learning. A vocabulary list is used as a key for activities; a variety of worksheets is included, plus an evaluation sheet for each level. Objectives are specified. (MS)

**********
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
**********

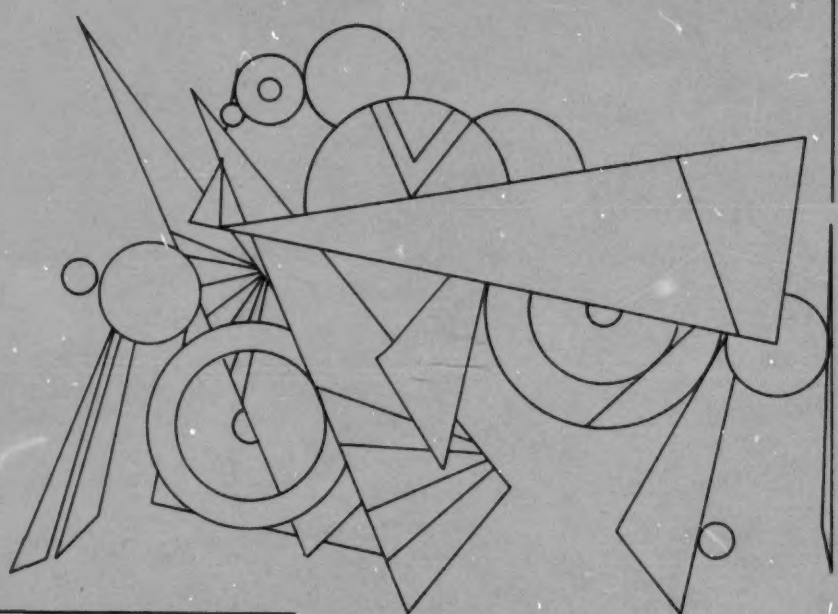
"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY
Juanita Sorenson
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC) AND USERS OF THE ERIC SYSTEM."

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

SE

ED148577

# INDIVIDUALIZED GEOMETRY



SE 023 290

# INDIVIDUALIZED GEOMETRY

# A Geometry Unit for the Intermediate Grades

by

Dennis Geissler

with

Richard Larson

UNIVERSITY OF WISCONSIN-EAU CLAIRE

EAU CLAIRE WI 54701

JULY 1977

This product was developed as a part of the ongoing preservice and inservice teacher education in the Department of Elementary Education at the University of Wisconsin-Eau Claire, Eau Claire WI 54701.

© CLIP 1977

# INTRODUCTION

This unit on Individualized Geometry is based on the Holt Math Series, levels 3, 4, 5, and 6. All the Geometric terms, the Scope & Sequence Chart, and the objectives are taken from that series. The Individualized Geometry Unit may be adapted to fit any school or classroom situation.

Individualized Geometry is based on the concepts of Individually Guided Education (IGE)--that each child has the opportunity to learn in his/her own way, at his/her own rate and in a program based on what he/she already knows. The primary objectives of this individualized unit are to facilitate the concepts of IGE and to emphasize guidance as a vital part of any math program. But even more important, each child is given the chance to learn in the best possible way.

This unit was designed to help those teachers who wish to individualize Geometry for the Intermediate Grades and was created with the hope that math might be more easily individualized by using the coordinated materials found in this manual.

The Individualized Geometry Unit is divided into seven levels: one for the third grade, and two levels for the fourth, fifth and sixth grades. All levels are sequenced with the letters a and b illustrating another topic of increasing difficulty. In addition, each level is designed for both individual and group learning. Each level contains a vocabulary list for Geometry that is used as a key for almost all the activities used in this unit. For example, if a puzzle at the 5a level is giving a child a problem because he/she does not remember what should be used to measure angles. The student then refers back to the vocabulary list and finds out that a protractor is needed.

Each level also consists of several activities, including construction worksheets, drawing worksheets and a geo-board worksheet included in the appendix. The geo-board worksheet can be used with geo-paper if not enough geo-boards are available.

Two appendices have an assortment of activities and worksheets. These can be used whenever thay are appropriate. Appendix A includes: geo-paper, geo-board worksheets and construction patterns for the creation of 3-D shapes. Appendix B includes: geo-match cards, geo-bingo game and flash cards and a geometric maze puzzle as well as other games and activities. The bingo is split into three levels and can be used at the appropriate levels in the unit.

An evaluation sheet is also included for the assessment of each level.

Richard Larson initiated the revision of content and format; Chris Wollack and Laura Manthey contributed artistically to the revised edition.

Special thanks to Bev Olson for the typing and format assistance.

D. G.

R. L.

# Contents


| | Page |
|---|---|
| Scope & Sequence | 1 |
| Geometric Objectives | 3 |
| Level 3 | 7 |
| Level 4a | 13 |
| Level 4b | 21 |
| Level 5a | 31 |
| Level 5b | 41 |
| Level 6a | 49 |
| Level 6b | 61 |
| Appendix A | 69 |
| Appendix B | 85 |
| Bibliography | 187 |

# GEOMETRY LEVELS

## SCOPE AND SEQUENCE

3 Length - Inches, Feet, and Yards - Centimeters - Meters - Extra Information - Points, Paths, and Line Segments - Lines and Rays - Circles

4a Points and Paths - Line Segments - Rays - Angles - Problem Solving with Charts - Lines - Intersecting and Parallel Lines - Curves - Circles - Problem Solving

4b Polygons - Triangles - Rectangles and Squares - Diagonals - Problem Solving - Slides and Turns - Flips - Symmetry - Cubes and Rectangular Prisms - Cylinders and Cones - Spheres

5a Lines and Line Segments - Rays and Angles - Measuring Angles - The Protractor - Perpendiculars - Polygons - Circles - Slides and Turns - Flips - Symmetry - Congruent Figures - Construction - Problem Solving

5b Measuring - Scale Drawing - Map Reading - Perimeter - Area - Solid Shapes - Volume - Problem Solving

6a Segments, Rays, and Lines - Angles - Measuring Angles - Parallel and Perpendicular Lines - Problem Solving - Polygons - Perimeter - Slides, Flips, and Turns - Congruent Figures - Copying and Bisecting

6b Area - Right Triangles - Problem Solving - Parallelograms - Triangles - Circles - Space Figures - Correcting Mistakes - Volume - Surface Area - Similar Figures - Scale Drawing

# GEOMETRIC OBJECTIVES

## 3 Level

1. To recognize pictures of line segments, lines and rays
2. To recognize centers, radii, and diameters of circles

## 4a Level

1. To identify, name, and draw points, line segments, and endpoints of line segments
2. To identify, name, and draw rays, angles and their parts
3. To identify right angles, angles greater than a right angle, and angles smaller than a right angle
4. To identify and draw curves, closed curves, and simple closed curves
5. To identify, name, and draw lines, intersecting lines, and parallel lines (and segments)
6. To identify, name, and draw circles, radii, and diameters

## 4b Level

1. To identify polygons
2. To identify triangles and right triangles
3. To identify the angles, sides, and vertices of a triangle
4. To identify rectangles and squares
5. To identify slides, flips, and turns
6. To draw lines of symmetry
7. To identify spheres, cones, cylinders, rectangular prisms, and cubes

## 5a Level

1. To review and extend ideas of points, line segments, and rays
2. To recall that an angle is constructed with two rays that have a common endpoint
3. To use a protractor to find the measure of an angle

GEOMETRIC OBJECTIVES 5a Level - cont.

4. To recognize sub-families of quadrilaterals and parallelograms
5. To recognize right angles and recall that their measure is $90^{o}$
6. To identify line segments related to circles
7. To slide, flip, and turn geometric figures to test for congruency

5b Level

1. To find the perimeter of any polygon using one of three formulas
2. To find the area of figures by counting a number of unit regions
3. To find the area of a rectangle using a formula
4. To find the area of a right triangle using half the area of a rectangle
5. To recognize spheres, cylinders, cubes, rectangular prisms, and cones
6. To find the volume of a rectangular prism by counting or by using a formula

6a Level

1. To identify and draw a point, line segment, line, ray, or angle
2. To measure and draw an angle with a protractor, name its vertex and sides, and identify it as right, acute, or obtuse angle
3. To identify a pair of lines as parallel, perpendicular, or neither
4. To find the measure of any third angles of a triangle, given the measure of the other two angles
5. To identify and draw a trapezoid, parallelogram, rectangle, square, or rhombus
6. To find the perimeters of some polygons
7. To determine whether or not two figures are congruent, using the idea of slides, flips, or turns
8. To copy or bisect a line segment or angle

6b Level

1. To find the area of a square, rectangle, triangle, parallelogram, circle

GEOMETRIC OBJECTIVES 6b Level - cont.

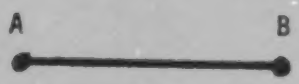
2. To find the circumference of a circle
3. To identify a cylinder, sphere, cone, rectrangular prism
4. To distinguish an interior from a surface in a cylinder, sphere, cone, rectangular prism
5. To find the volume and surface area of a rectangular prism
6. To determine the side of a similar triangle using ratio

# LEVEL 3

GEOMETRIC VOCABULARY
GEOMETRIC WORKSHEET
GEOMETRIC PUZZLE NUMBER 1
EVALUATION SHEET
GEO-BOARD WORKSHEET - APPENDIX A

# GEOMETRIC VOCABULARY

1. Line Segment - The shortest path between two points

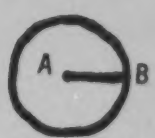



2. Line - Goes on forever in two directions

3. Ray - Goes on forever in one direction

4. Circle - A special simple closed curve. All points on a circle are the same distance from the center.

5. Radius - A line segment from the center to a point on the circle




6. Diameter - A line segment that goes through the center of a circle. It goes between two points on the circle.

# GEOMETRIC WORKSHEET

Using a straightedge and a pencil, draw a line segment and its endpoints.

Using a straightedge and a pencil, draw a line and name that line with two points.

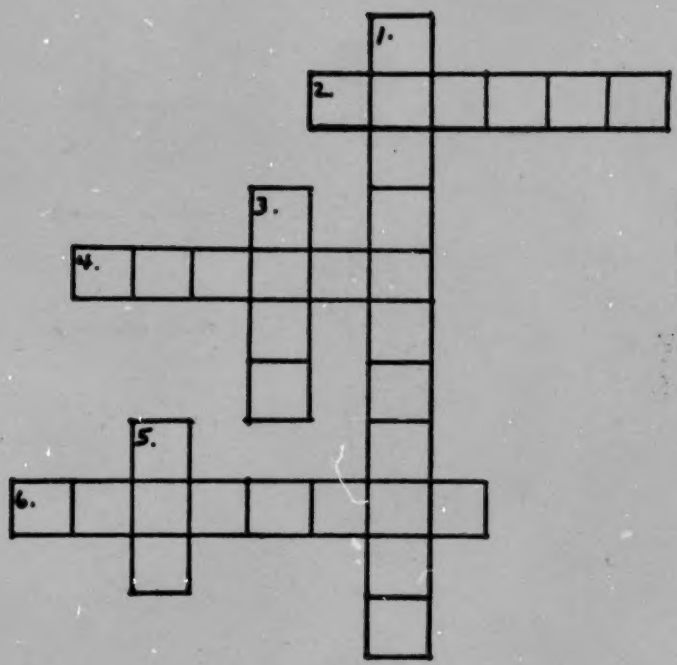
Using a straightedge, draw a ray and name the ray with two points.

Using a compass, draw a circle. (You may want to try it more than once.)

Using a compass, draw another circle. Draw radius AB inside the circle.

Draw a circle, using a compass. Label the center point of the circle B.
Draw a diameter and label it AC.

# GEOMETRY PUZZLE #1




Across:

2. A special simple closed curve with points on the curve equal distance from the center

4. A line segment from the center of the circle to a point on the circle

6. A line segment through the center of a circle and to points on the circle

Down:

1. The shortest path between two points

3. Goes on forever in two directions

5. Goes on forever in one direction

# GEOMETRIC EVALUATION

**Matching:** Draw a line from the word to the picture it shows

Line Segment

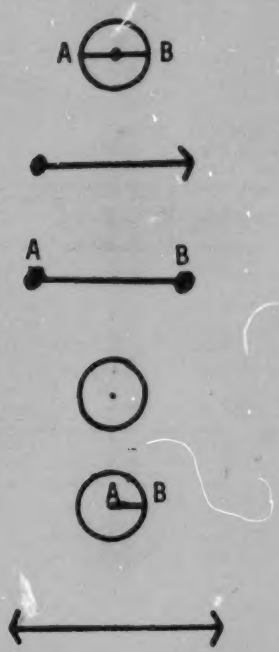
Line

Ray

Circle

Radius

Diameter




Using a straightedge/ruler draw the following:

Line Segment

Ray

Line

Which circle below has a radius in it? Put a circle around the correct answer.

# LEVEL 4a

GEOMETRIC VOCABULARY

GEOMETRIC WORKSHEET

GEOMETRY PUZZLE NO. 2

EVALUATION

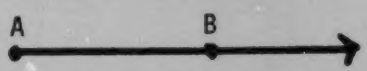
GEO-BOARD WORKSHEET - IN APPENDIX A

# GEOMETRIC VOCABULARY

1. Point - We think of a point as a location. A point is pictured by a dot. It is named with a capital letter.

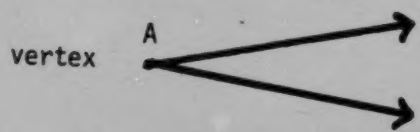
2. Line Segment - A straight path between two endpoints. We name a segment like this: $\overline{EF}$ It is read line segment EF.

3. Ray - Goes on forever in one direction. We name it: $\overrightarrow{AB}$ The endpoint is always named first.



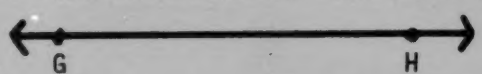

4. Angle - Formed by two rays.

5. Vertex - The common point where two rays meet to form an angle.

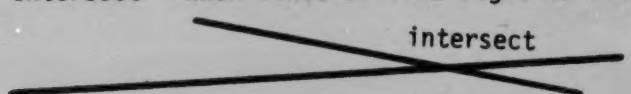



6. Sides - The rays forming the angle.

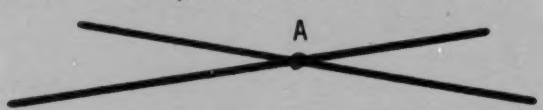
7. Line - Goes on forever in both directions. We name a line like this: $\overleftrightarrow{GH}$



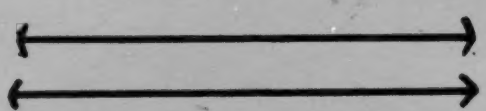

8. Intersect - When lines or line segments cross or touch.




9. Common Point - The point where lines or line segments intersect.

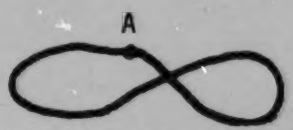



10. Parallel - Two lines or line segments on a flat surface that never intersect no matter how long they are.

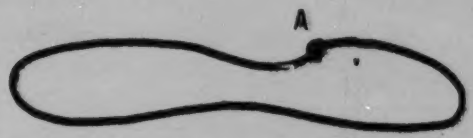


GEOMETRIC VOCABULARY - cont.

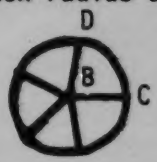
11. Closed Curve - Ends where it starts.




12. Simple Closed Curve - Ends where it starts and does not cross or touch itself

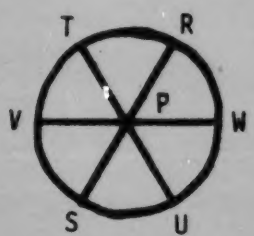



13. Radius - Each radius of a circle has the same length




$\overline{BC} = \overline{BD}$

14. Diameter - Each segment through the center of the circle, with both endpoints on the circle



# GEOMETRIC WORKSHEET

Draw a point. Name the point.

Draw a line segment and give it endpoints.

Draw a ray. Name the ray.

Draw an angle with two rays.

Draw an angle. Name its vertex.

Draw a line. Name it.

# GEOMETRIC WORKSHEET

Intersect two lines.

Intersect two lines and name the common point.

Draw a set of parallel lines.

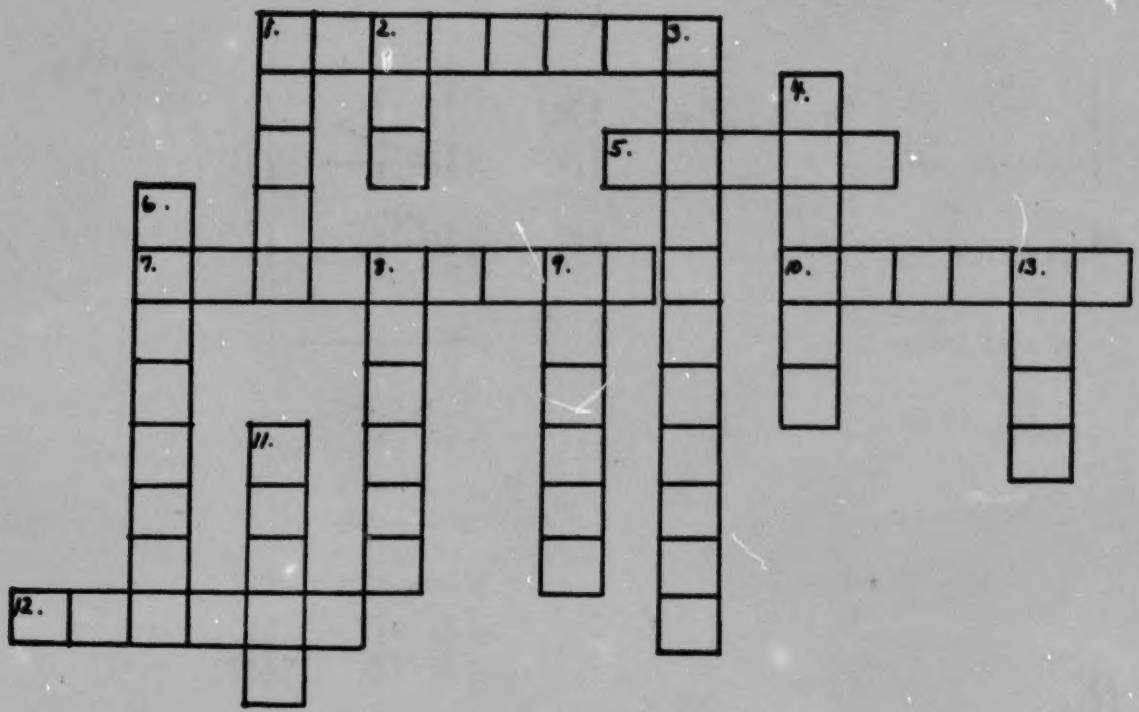
Draw a closed curve. Then draw a simple closed curve.

Draw a circle. Draw five Radii and label them.

Draw a circle. Draw three diameters and label them.

19

# GEOMETRY PUZZLE #2




Across:

1. Two lines in the same plane that never intersect are _____
5. Formed by two rays
7. When two lines cross they _____
10. A closed curve that ends where it starts and does not cross or touch itself is called _____
12. The common point where two rays meet to form an angle

Down:

1. A _____ is pictured by a dot
2. Goes on forever in one direction
3. A straight path between two end points
4. A curve which ends where it starts
6. The greatest distance in a circle is the _____
8. Half the diameter is a _____
9. The ___ point is where lines intersect
11. The rays forming an angle are called _____
13. Goes on forever in both directions

20

# GEOMETRIC EVALUATION

Matching: Draw a line from the word to the picture it shows.

Angle

Intersection

Parallel

Closed curve

Radius

Endpoints EF

Ray

Using a straightedge and compass draw the following:

Diameter

Simple Closed Curve

Point

Intersection

21

Line

# LEVEL 4b

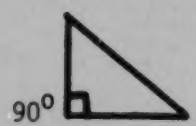
GEOMETRIC VOCABULARY
PATTERN FOR CUBES
PATTERNS FOR CYLINDERS AND CONES
GEOMETRIC WORKSHEET
GEOMETRIC PUZZLE NUMBER 3
EVALUATION WORKSHEET
GEO-BOARD WORKSHEET - APPENDIX A
GEO-MATCH CARDS - APPENDIX B
GEO-BINGO I - APPENDIX B

# GEOMETRIC VOCABULARY

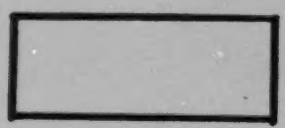
1. Polygon - A simple closed curve which is made of line segments.

2. Triangle - Has three sides, three angles, and three vertices.

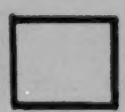
3. Right Triangle - A triangle with a right angle.



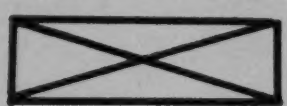

4. Rectangle - Has four sides and four right angles. Opposite sides of a rectangle have the same length.



5. Square - A special kind of rectangle with all four of its sides having the same length.



6. Diagonal - Separates a rectangle into two triangles. Two diagonals in any rectangle or any square have the same length.



7. Slide - Moving a figure left or right, up or down without changing size or shape.

23

GEOMETRIC VOCABULARY - cont.

8. Turn - Moving in a clockwise or counterclockwise direction without changing size or shape.

9. Flip - A figure does not change size or shape but its position is reversed.

10. Lines of Symmetry - The lines which split the figure into halves.

11. Symmetric - A figure is symmetric when each half of the figure is the flip of the other.

12. Sphere - Spheres look like oranges or balls.

13. Cube - Has six faces, has twelve edges, and eight vertices.

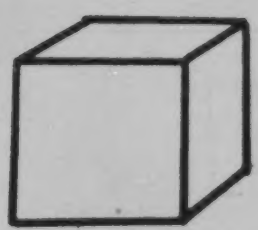
14. Rectangular Prism - Looks like a box. A cube is a special rectangular prism, this always has six faces, twelve edges, and eight vertices.

24

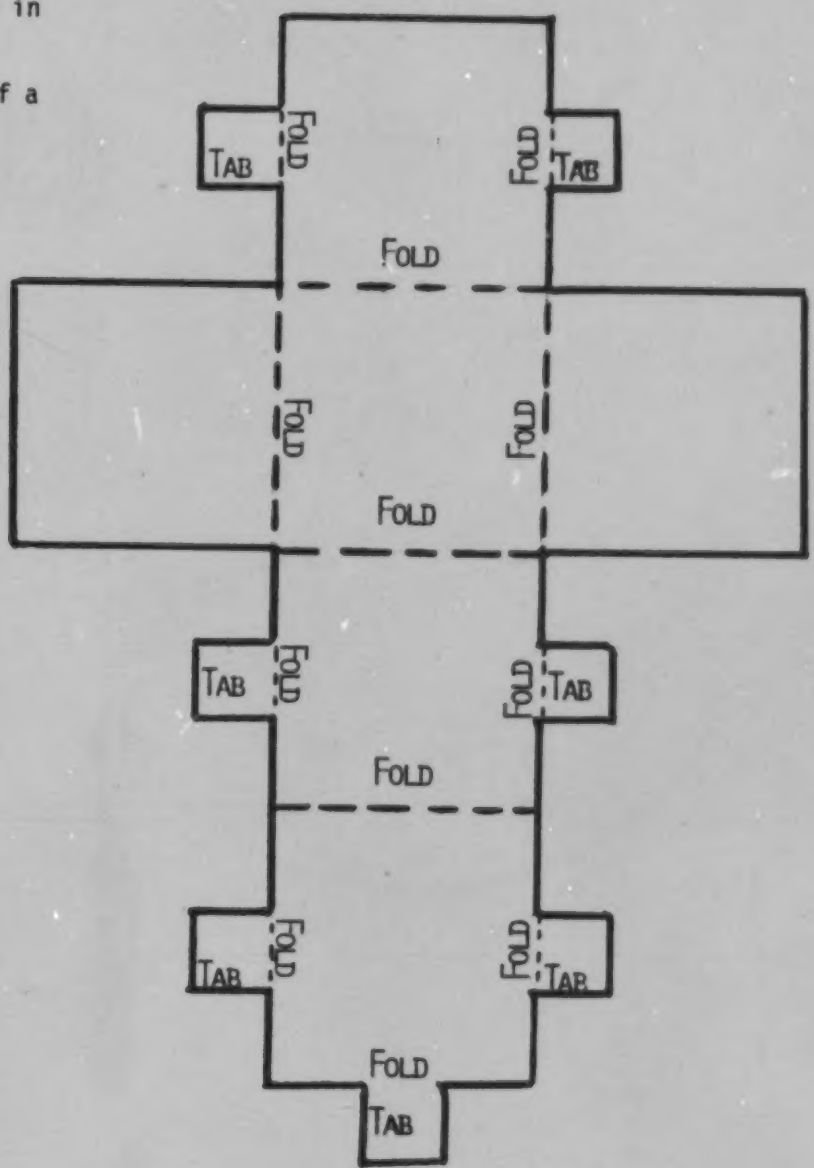
# CUBES

Directions for making your cube:

1. Cut out your pattern.
2. Fold as shown on the right. Glue or tape the tabs in place.
3. You've made a model of a cube.



CUBE






25

# CYLINDERS AND CONES

Cylinders:

1. You can make a paper model of a cylinder. Hold the ends of a piece together as shown above.

Cones:

1. Cut the above drawing out. Attach the tab with tape or glue. The result is a cone.

# GEOMETRIC WORKSHEET

Draw a polygon. (You may draw more than one.)

Draw a triangle. Now draw a right triangle.

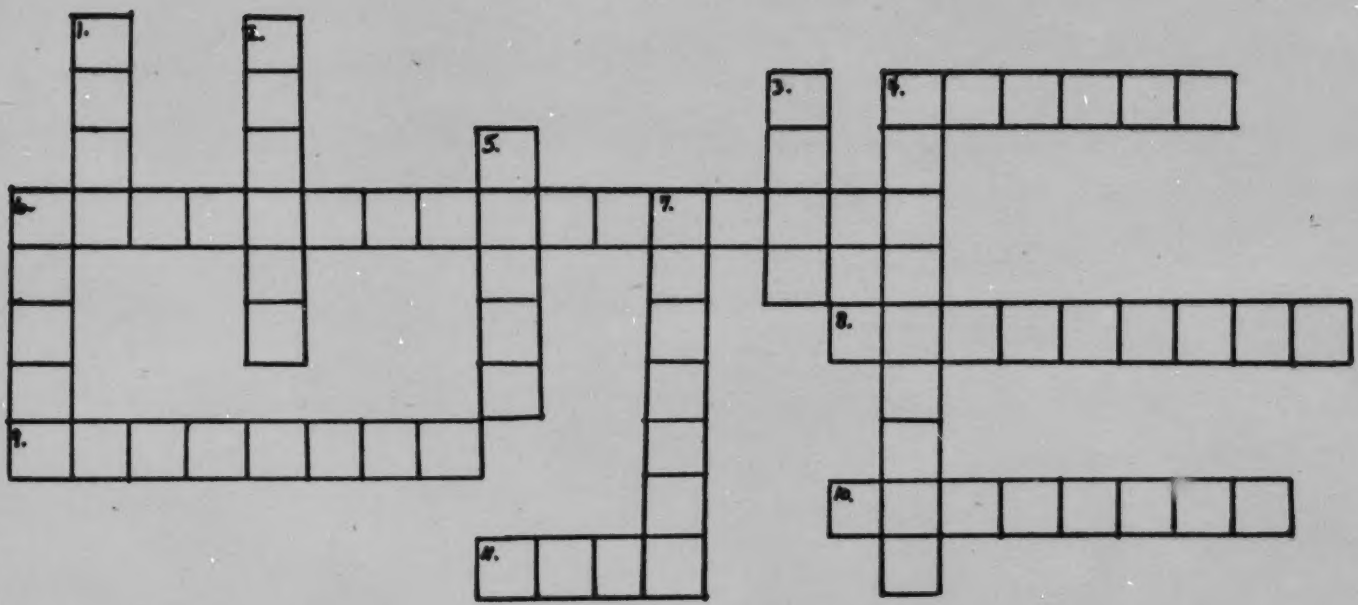
Draw a rectangle.

Draw a square.

Draw a rectangle. Now draw two diagonals inside the rectangle.

Draw a symmetric figure. Draw the line of symmetry.

# GEOMETRY PUZZLE #3



Across:

4. Looks like an orange or baseball

6. Looks like a box with rectangular faces

8. Four sides and four right angles, opposite sides have the same length

9. Has three sides, three angles, and three vertices

10. Separates a rectangle into two triangles

11. Moving an object in a clockwise or counterclockwise direction without changing shape

Down:

1. Has six faces, twelve edges, and eight vertices

2. A rectangle with all sides equal

3. A figure in its reversed position

4. When each half of a figure is a a flip of the other it is _____

5. Moving a shape left or right, up or down

6. A _____ triangle has a right angle

7. A simple closed curve which is made up of line segments

28

# GEOMETRIC EVALUATION

Matching: Draw a line from the word to the picture it shows.

Triangle

Rectangle

Square

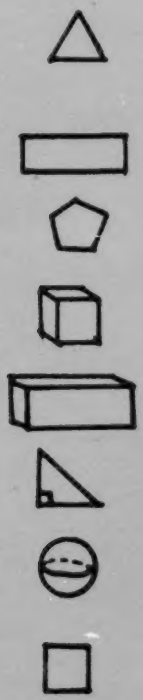
Sphere

Cube

Rectangular Prism

Right Triangle

Polygon



Using a straightedge draw the following:

Polygon

Slide

Turn

Flip

A Symmetric Figure with the Line of Symmetry.

# LEVEL 5a

GEOMETRIC VOCABULARY

CONSTRUCTING LINE SEGMENTS

COPYING ANGLES

GEOMETRIC WORKSHEET

GEOMETRY PUZZLE NUMBER 4

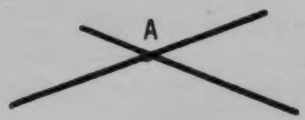
EVALUATION WORKSHEET

GEO-BOARD WORKSHEET - APPENDIX A

CONSTRUCTION PATTERNS - APPENDIX A

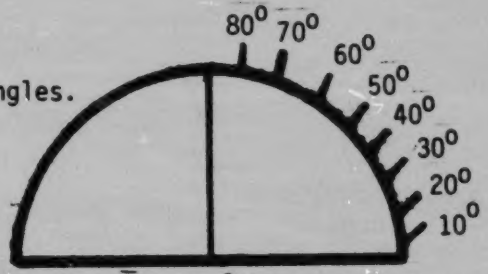
# GEOMETRIC VOCABULARY

1. Intersect - Two different lines or line segments cannot intersect in more than one point.



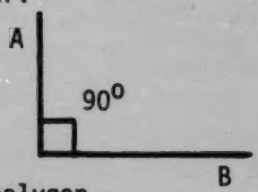

2. Degree - A standard unit of measure of an angle.

3. Protractor - Used to measure angles.

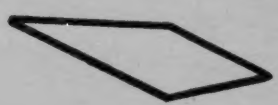



4. Perpendicular - When two lines intersect at $90^{\circ}$ they are said to be perpendicular.

$A \perp B$




5. Quadrilateral - Four-sided polygon.

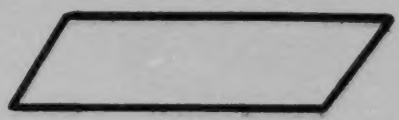


6. Pentagon - Five-sided polygon.

7. Hexagon - Six-sided polygon.

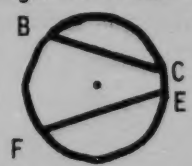
8. Trapezoid - A quadrilateral with at least one pair of sides parallel.

9. Parallelogram - A quadrilateral with two pairs of sides parallel.

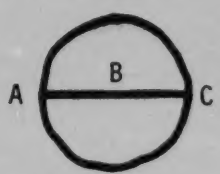


10. Rhombus - A parallelogram with all of its sides the same length.

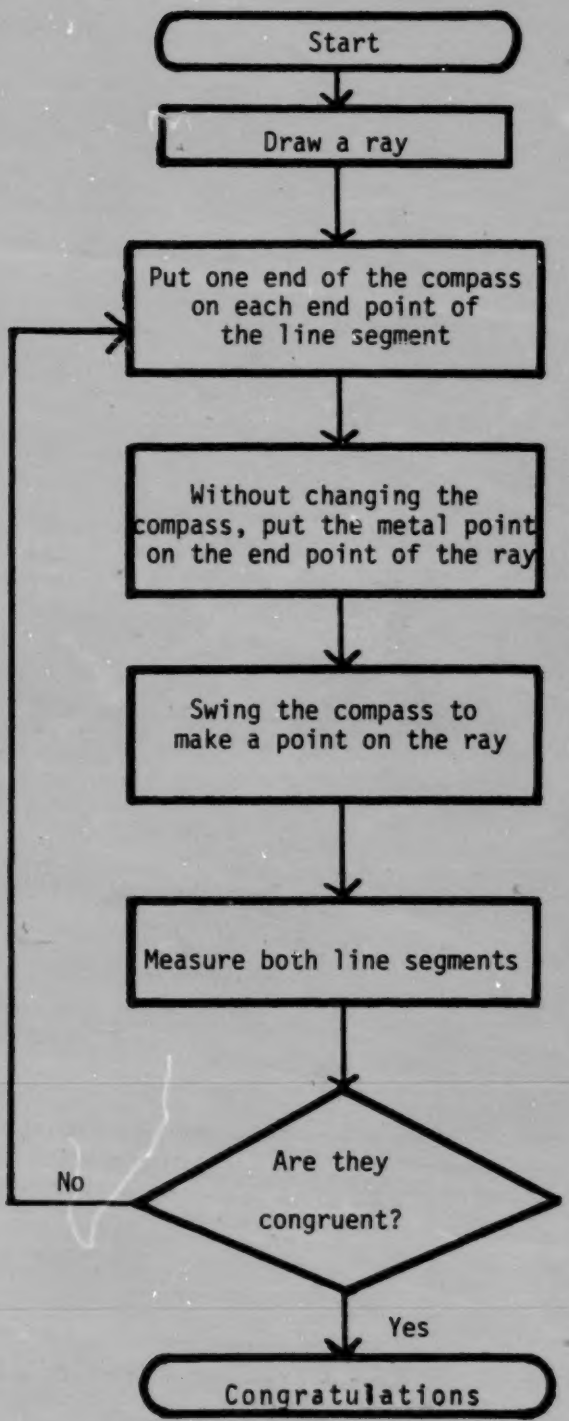
11. Chord - A line segment whose endpoints are on a circle.




12. Diameter - A chord which passes through the center of a circle.

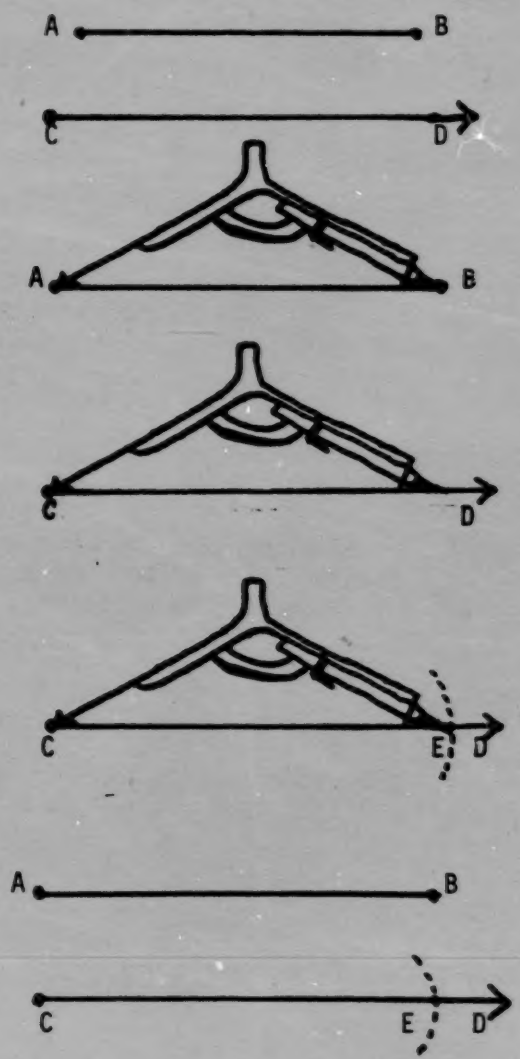


# CONSTRUCTING LINE SEGMENTS


Start
Draw a ray
Put one end of the compass on each end point of the line segment
Without changing the compass, put the metal point on the end point of the ray
Swing the compass to make a point on the ray
Measure both line segments
Are they congruent?
No
Yes
Congratulations

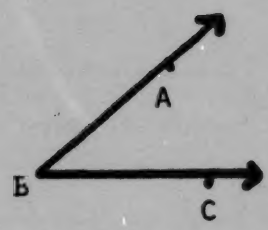
EXAMPLE

Construct a line segment congruent to AB

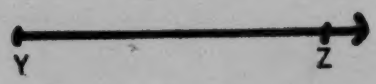


# COPYING ANGLES

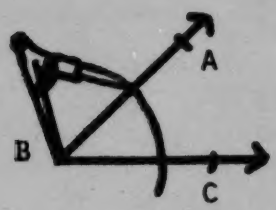
1. We can copy an angle using a compass and a straightedge. Let's copy ABC.



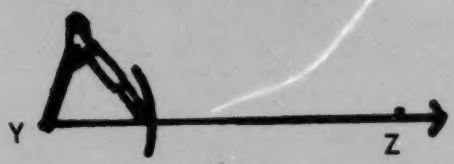

2. Draw ray YZ.



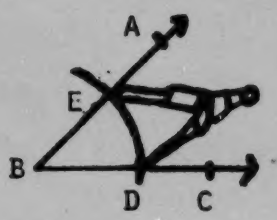

3. Open your compass and draw part of a circle or an arc using point B as a center.



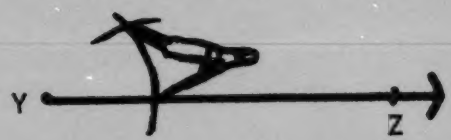

4. Without changing the width of the compass, draw an arc crossing YZ using point Y as a center.



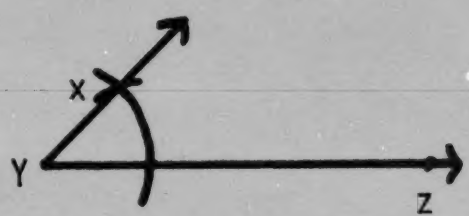

5. Open your compass to measure the distance from point D to point E.




6. Mark off the same distance on the arc cross crossing YZ.




7. Draw ray YX where the arcs meet. XYZ is congruent to ABC. Check your work with a protractor.




34

# GEOMETRIC WORKSHEET

Intersect two lines and label the one point of intersection.

Draw perpendicular lines.

Draw a quadrilateral.

Draw a pentagon.

Draw a hexagon.

# GEOMETRIC WORKSHEET

Draw a trapezoid.

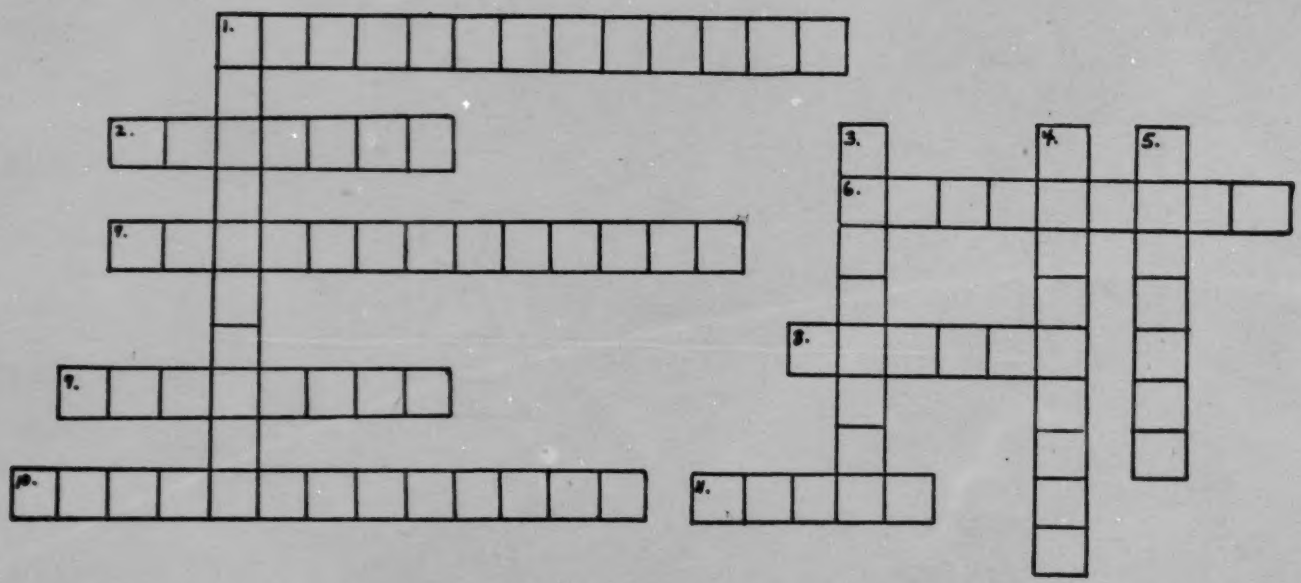
Draw a parallelogram.

Draw a rhombus.

Draw a circle. Draw and label two chords inside the circle.

Draw a circle. Draw the longest possible chord inside the circle and label it.

# GEOMETRY PUZZLE #4



Across:

1. A quadrilateral with two pairs of sides parallel
2. A parallelogram with all of its sides the same length
6. Two lines cannot _____ in more than one point
7. When two lines intersect at $90^{0}$ they are said to be _____
8. A standard unit of measure for an angle is a _____
9. A five equal-sided polygon is a _____
10. A four-sided polygon is a _____
11. A line segment whose endpoints are on a circle is a _____

Down:

1. Something to measure angles
3. A chord which passes through the center of a circle
4. A quadrilateral with at least one pair of sides parallel
5. A six equal-sided polygon is a _____

# GEOMETRIC EVALUATION

Matching: Draw a line from the word to the picture it shows.

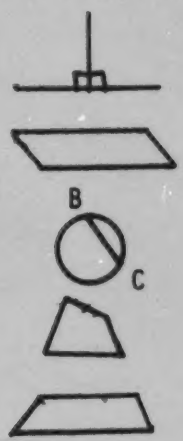
Perpendicular

Quadrilateral

Trapezoid

Parallelogram

Chord




Using a straightedge or compass draw the following:

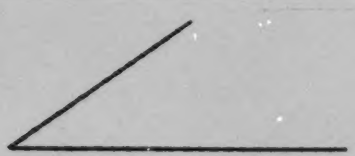
Diameter

Pentagon

Hexagon

Construct a line segment congruent to the one below. (Hint: Use a compass.)

Construct an angle congruent to the one below.



# LEVEL 5b

GEOMETRIC VOCABULARY

GEOMETRIC WORKSHEET

GEOMETRY PUZZLE NUMBER 5

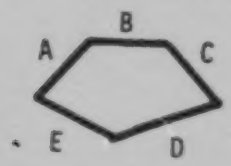
EVALUATION WORKSHEET

GEO-BOARD WORKSHEET - APPENDIX A

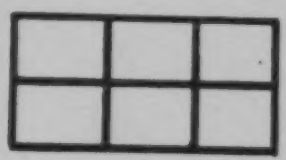
GEO-BINGO II - APPENDIX B

# GEOMETRIC VOCABULARY

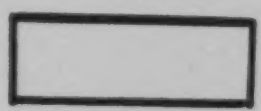
1. Perimeter - The distance around a figure.



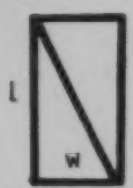

2. Area - Number of unit regions in a region.



3. Rectangle Area - Area is the product of the length X width.



4. Right Triangle Area - Area is ½ X length X width.




5. Length Units - Inches, centimeters, etc.

6. Area Units - Square inches, square centimeters,

7. Volume Units - Cubic inch, cubic centimeter.

GEOMETRIC VOCABULARY - cont.

8. Volume - The number of cubic units in a solid.

9. Volume of Rectangular Prism - Volume is the product of the length X width X height, or L x W x H.

# GEOMETRIC WORKSHEET

Draw a quadrilateral. Measure its sides and add them together to get the perimeter.

Draw a rectangle. Divide it into equal unit regions.

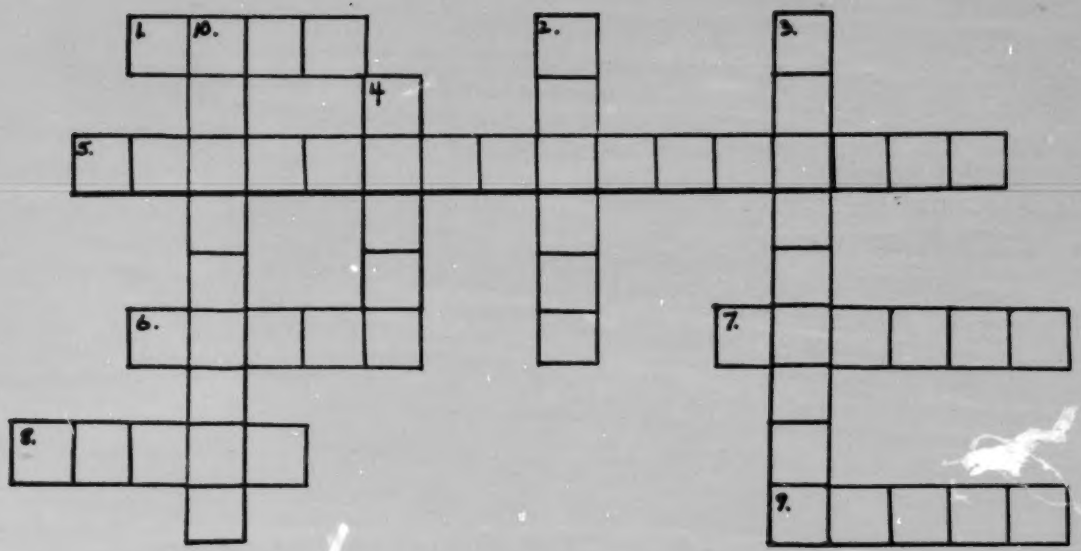
Draw a rectangle. Measure the length and width. Multiply to get the area.

Draw a rectangle and draw one diagonal inside. Measure the sides and find the area.

Draw two length units.

Draw two area units.

# GEOMETRY PUZZLE #5




Across:

1. The number of unit regions in a region is called the _____
5. The volume of a _____ equals the product of the length X width X height
6. A cubic inch or a cubic centimeter can be called volume _____
7. Inches, centimeters, etc. can be called _____ units
8. Two rays meet to form an _____
9. The area of a _____ triangle equals $\frac{1}{2}$ X length X width

Down:

10. _____ area equals length X width
2. The number of cubic units in a solid is called the _____
3. The distance around a figure is _____
4. Square inches, square centimeters, etc. are called area _____

# GEOMETRIC EVALUATION

Matching: Match the word with the correct figure.

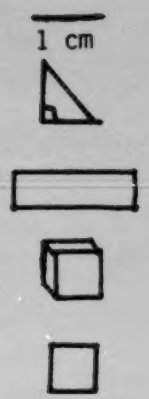
Length units

Area units

Volume units

Length x width

1/2 x length x width




Give the definition of these terms:

Perimeter

Area

Volume

Write the correct formula for finding the area of the following:

Rectangle

Right triangle

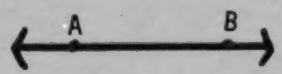
Rectangular prism

# LEVEL 6a

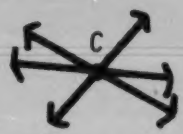
GEOMETRIC VOCABULARY
USING A PROTRACTOR
BISECTING SEGMENTS
BISECTING ANGLES
GEOMETRIC WORKSHEET
GEOMETRY PUZZLE NUMBER 6
EVALUATION WORKSHEET
GEO-BOARD WORKSHEET - APPENDIX A

# GEOMETRIC VOCABULARY

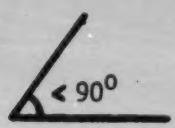
1. One Line - Through two points there is only one line.



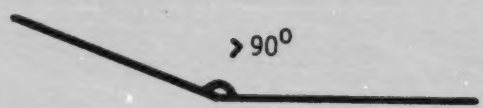

2. One Point - Through one point is an infinite number of lines.




3. Acute Angle - An angle smaller than a right angle.




4. Obtuse Angle - An angle larger than a right angle.

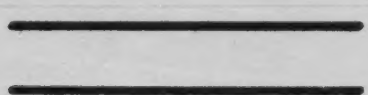



5. Central Angle - This is called a degree and is one way to measure angles.

360° in a circle

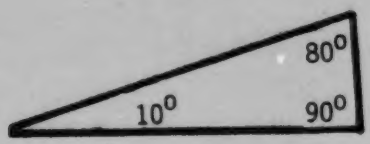
6. Congruent - Angles with the same measures are congruent.

7. Parallel Lines - Two lines in the same plane which do not intersect.



GEOMETRIC VOCABULARY - cont.

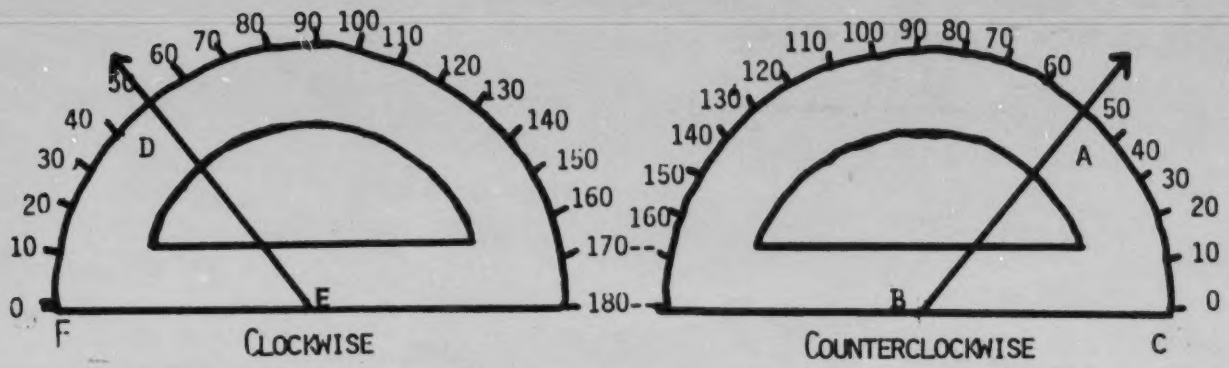
8. Triangles - The sum of the angles of triangles are $180^{o}$.



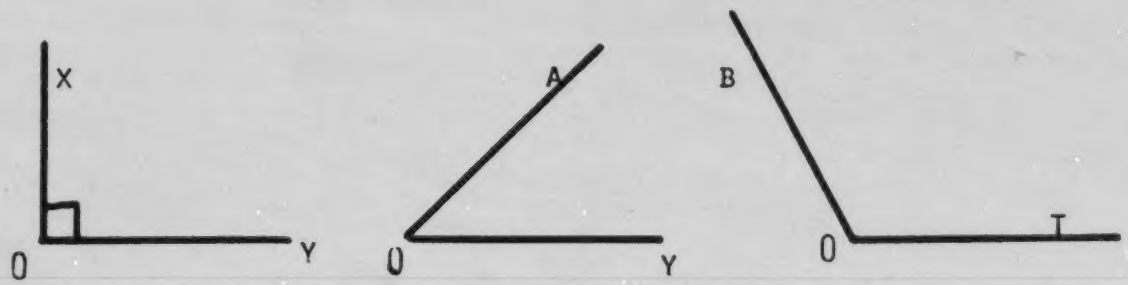

9. Simple Closed Curve - Points can be on the curve, in the interior or in the exterior.

# USING A PROTRACTOR

Most protractors have two scales. You can read one scale in a clockwise direction and the other in a counterclockwise direction. Because ABC and DEF have the same measurement, we say they are congruent.

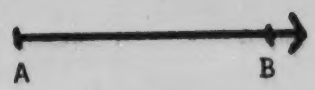



Give the measurement of each angle using a protractor.

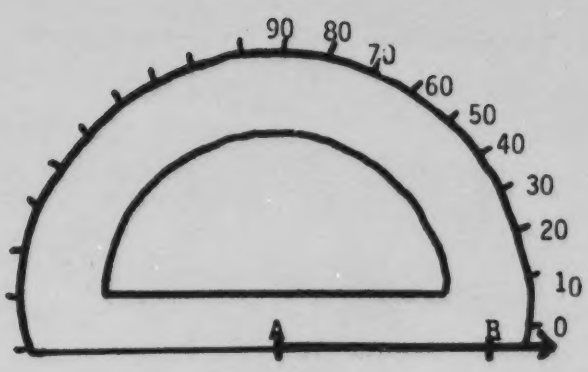


# USING A PROTRACTOR

Here's how to draw a $30^{o}$ angle.

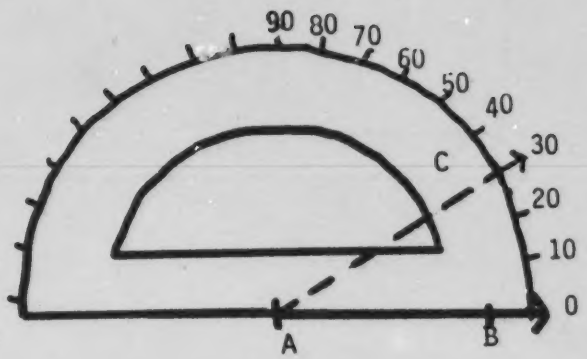



1. Draw a picture of ray AB.

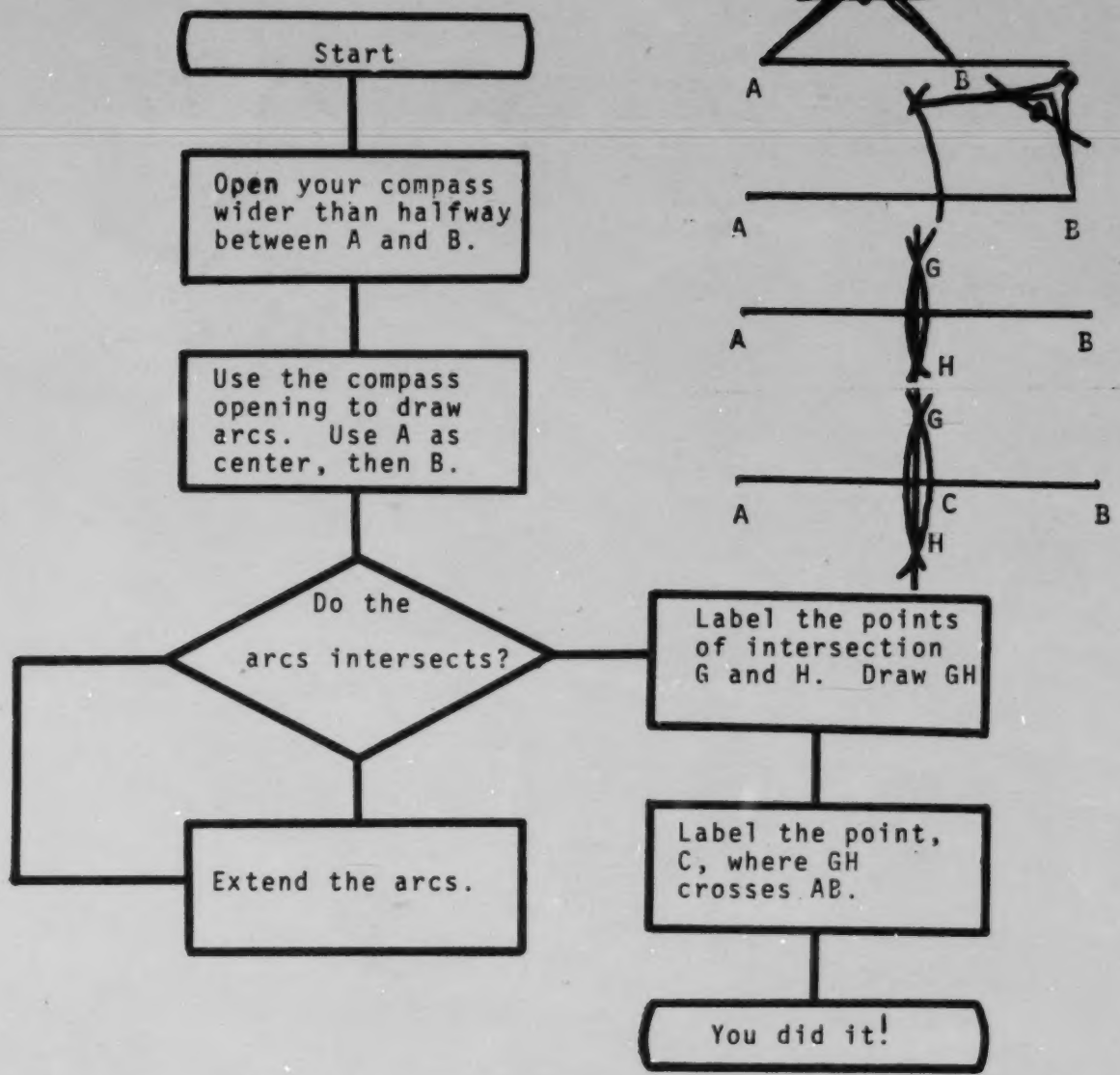



2. Place your protractor with its center mark on A, and the $0^{o}$ mark along AB.

3. Mark C at the $30^{o}$ mark, and draw ray AC.



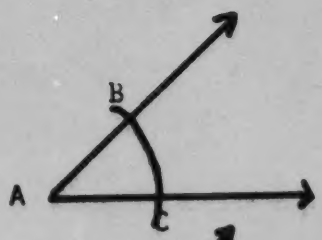
# BISECTING SEGMENTS


Start
Open your compass wider than halfway between A and B.
Use the compass opening to draw arcs. Use A as center, then B.
Do the arcs intersects?
Extend the arcs.
Label the points of intersection G and H. Draw GH
Label the point, C, where GH crosses AB.
You did it!
A
B
G
H
C

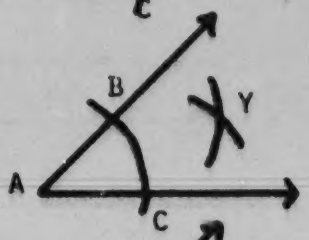
# BISECTING ANGLES

Now we'll bisect an angle

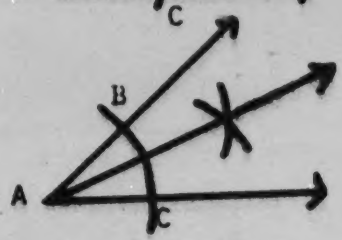
1. Draw an angle, ∠A. Draw an arc with the center A.




2. Use B and C as centers to draw these new arcs which cross at Y. Be sure to keep your compass opening the same for these new arcs.




3. Draw ray AY. It bisects ∠BAC.



# GEOMETRIC WORKSHEET

Draw two points. Draw a line through those two points.

Draw a point. Draw three lines through that point.

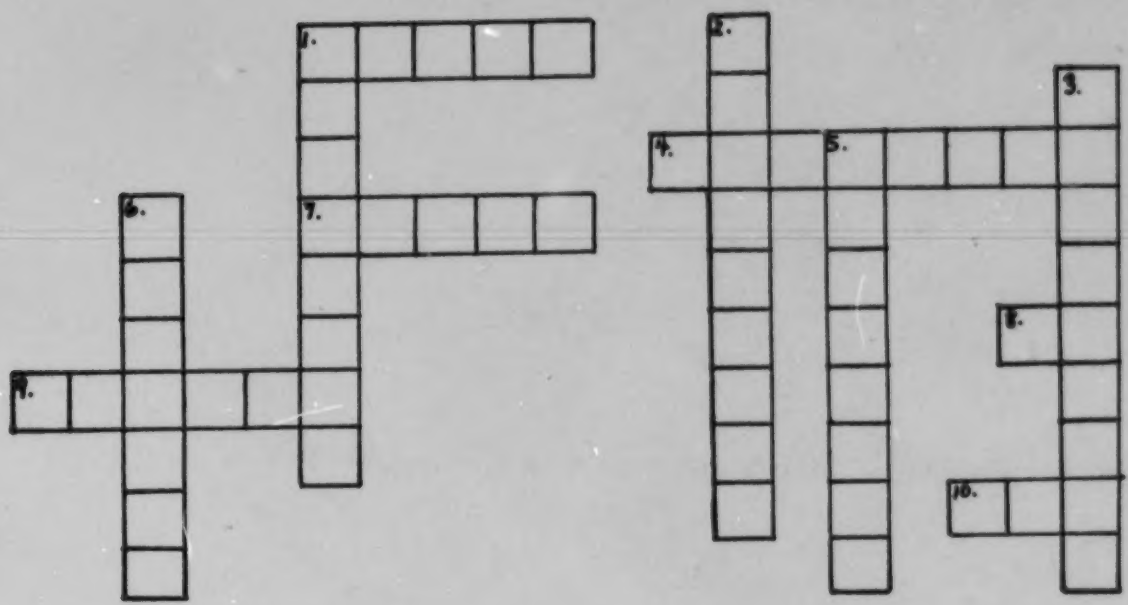
Draw an acute angle. Measure the angle with a protractor to make sure.

Draw an obtuse angle. Measure with a protractor to make sure.

Draw two congruent angles. (Refer to Construction Worksheets.)

Draw a triangle. Measure all the angles and add together. (Do they equal $180^{o}$?)

# GEOMETRY PUZZLE #6




Across:

1. An infinite number of lines run through one _____
4. If a point does not lie in the exterior or on the curve it lies in the _____
7. An angle smaller than a right angle is _____
8. If a point is neither in the exterior or interior of a curve it is _____ the curve
9. An angle larger than a right angle is _____
10. Through two points there is only _____ line

Down:

1. Two lines in the same plane which do not intersect are _____ lines
2. Angles with the same measure are _____
3. The sum of the angles of _____ is $180^{o}$
5. If a point does not lie in the interior of a curve or on the curve it is in the _____
6. A degree is called a _____ angle

# GEOMETRIC EVALUATION

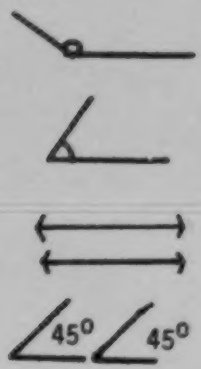
Matching: Match the word with the correct figure.

Acute Angle

Obtuse Angle

Congruent Angles

Parallel Lines




Drawing the following using a straightedge:

Parallel Lines

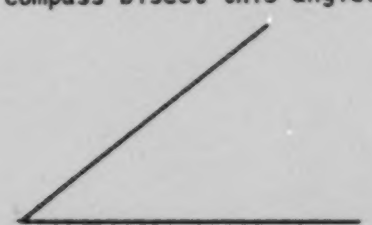
Acute Angle

Three Lines through One Point

One Line through Two Points

A Simple Closed Curve with one point on the curve, one in the interior, and one in the exterior

Use a protractor to measure the angle below.
Using a compass bisect this angle. Also use a straightedge to finish.



# LEVEL 6b

GEOMETRIC VOCABULARY

GEOMETRIC WORKSHEET

GEOMETRY PUZZLE NUMBER 7

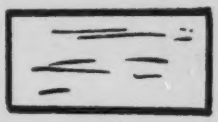
EVALUATION WORKSHEET

GEO-BOARD WORKSHEET - APPENDIX A

GEO-BINGO III - APPENDIX B

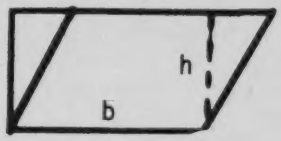
# GEOMETRIC VOCABULARY

1. Region - The interior of a simple closed curve.



2. Parallelogram Area - Take the base x height.

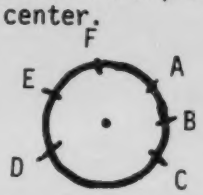
b x h = area



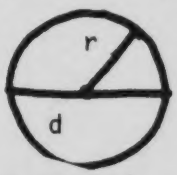

3. Triangle Area - Take the base x height x ½.

$$\frac{b \times h}{2}$$

4. Circle - Is the set of all points in a plane that are the same distance from a given point, the center.

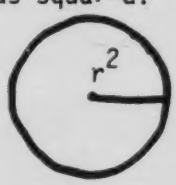



5. Diameter - Is twice the length of a radius.

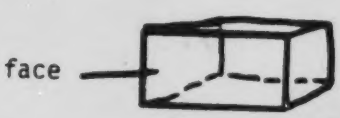



6. Circle Area - Is $\pi$ x a radius squared.

pi = $\pi$ = 3.14




7. Face - The side of a rectangular prism.



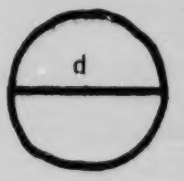
GEOMETRIC VOCABULARY - cont.

8. Cylinder - Like a can of peaches.

9. Cone - Like an ice cream cone.

10. Circumference - The length around any circle. Circumference is equal to $\pi$ x diameter.

$\pi = 3.14$




$d \times \pi = c$

# GEOMETRIC WORKSHEET

Draw a simple closed curve. Draw point B on the curve. Draw point A in the interior of the curve. Draw point C in the exterior of the circle.

Write the formula for the area of a parallelogram.

Write the formula for the area of a triangle.

Write the formula for an area of a circle.

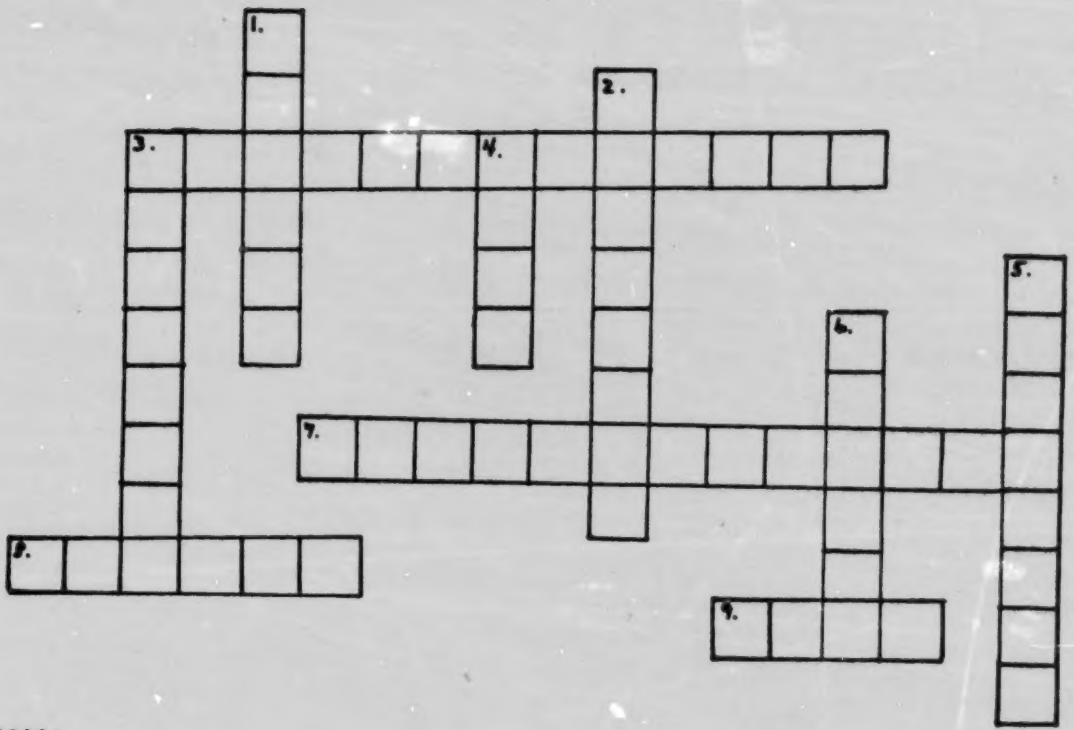
Write the formula for the circumference of a circle.

Write the formula for the volume of a rectangular prism.

Write the formula for the area of a rectangle.

Write the formula for the area of a right triangle.

# GEOMETRY PUZZLE #7




Across:

3. The length around any circle
7. Base x height = the area of a _____
8. Is the set of points in a plane that are the same distance from the center
9. Like an ice cream _____

Down:

1. Pi x $R^2$ = the area of a _____
2. Base x height x ½ = the area of a _____
3. This is like a tin can
4. The side of a rectangular prism is called
5. Is twice the length of a radius
6. The interior of a simple closed curve

59

# GEOMETRIC EVALUATION

Matching: Match the word with the correct figure.

Pi

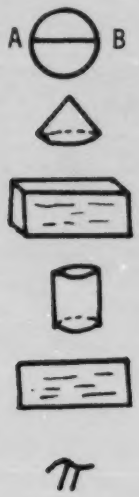
Cylinder

Cone

Diameter

Region

Face




Matching: Match the word with the correct formula for finding the area.

| | |
|---|---|
| Parallelogram | Pi x Diameter = |
| Triangle | Pi x Radius$^2$ = |
| Circle | 1/2 x Base x Height = |
| Circumference | Base x Height = |

Problems:

1. Find the circumference of a circle with a diameter of three inches.
   (Hint: What is the formula for finding the circumference of a circle?)

2. The _____ is twice the length of a radius.

# APPENDIX

# A

GEO-BOARD WORKSHEET - ALL LEVELS - PAGES 72-74
GEO-PAPER - PAGE 75
CONSTRUCTION PATTERNS FOR: - PAGES 77-83
CUBE
SQUARE PYRIMADS
RECTANGULAR PRISM
RECTANGULAR PYRAMID
HEXAGONAL PRISM
HEXAGONAL PYRAMID
RIGHT CIRCULAR CYLINDER
RIGHT CIRCULAR CONE

# APPENDIX A

## GEO-BOARD WORKSHEETS

The geo-board worksheets are designed to give a child some guidance when working with the geo-board. There are worksheets for every level. These geo-board worksheets are designed to be adopted for use with geo-paper. Using geo-boards and geo-paper will give the child an opportunity to really grasp geometric concepts.

## CONSTRUCTION WORKSHEETS

This section includes a set of construction patterns that will guide children in reproducing geometric solids such as cubes and cylinders. These patterns will compliment the cutout patterns that were used somewhat eariler in the unit. Included in these patterns are the most basic and complex geometric shapes.

## CONSTRUCTION ACTIVITIES

### GEO-CITY - 3-D

The geo-city is an excellent activity to motivate the construction of geometric shapes and solids. Each child can contribute to the construction of their own city in the classroom. Children may display creativity by constructing solids in the shape of houses, trees, animals, people, etc.

### GEO-CITY - 2-D

A geo-city with cutout shapes might be more practical with the primary grades. This type of activity may be used as a bulletin board or classroom display to motivate children.

## NOTE

The geo-board worksheets are together on three sheets so that a child will not be limiting himself to just one level. The construction worksheets are for constructing geometric solids and can be integrated into any level.

# GEOBOARD WORKSHEET

Level 3.1

Materials: Geoboards, Rubber Bands

1. Using the geoboard make as many different designs you can think of.
2. Make as many shapes as you wish.
3. Make a line segment on the geoboard.
4. Make a circle.
5. Make a circle with a radius.
6. Make a circle with a diameter.

Level 4.1

1. Find a point on the geoboard.
2. Make a line segment on the goeboard and find its endpoints.
3. Make an angle on the geoboard.
4. Find the vertex of the angle you just made.
5. Intersect two lines and find the point of intersection.
6. Make a set of parallel lines.
7. Make a closed curve.
8. Make a circle with five radii.
9. Make a circle with three diameters.

Level 4.2

1. Make a polygon.
2. Make a triangle.
3. Make a right triangle.
4. Make a rectangle.
5. Make a square.
6. Make a rectangle with diagonals.

# GEOBOARD WORKSHEET

Level 4.2 (Cont.)

7. Make a slide.
8. Make a turn.
9. Make a flip.
10. Make a symmetric figure with a line of symmetry.

Level 5.1

1. Make perpendicular lines.
2. Make a quadrilateral.
3. Make a pentagon.
4. Make a hexagon.
5. Make a trapezoid.
6. Make a parallelogram.
7. Make a rhombus.
8. Make a circle with two chords.
9. Make a circle with the longest possible chord (diameter).

Level 5.2

1. Make a pentagon and find its perimeter.
2. Make a rectangle and divide it into unit regions.
3. Make several length units.
4. Make several area units.

Level 6.1

1. Find a point and put several line segments through that point.
2. Make an acute angle.
3. Make an obtuse angle.
4. Make a set of congruent angles and measure the angles with a protractor.

# GEOBOARD WORKSHEET

Level 6.1 (Cont.)

5. Make a triangle and measure each of the angles with a protractor. Add the measurements together and see if the sum of the angles equals $180^{o}$.

6. Make a large closed curve. Find points on the curve, in the interior, and in the exterior.

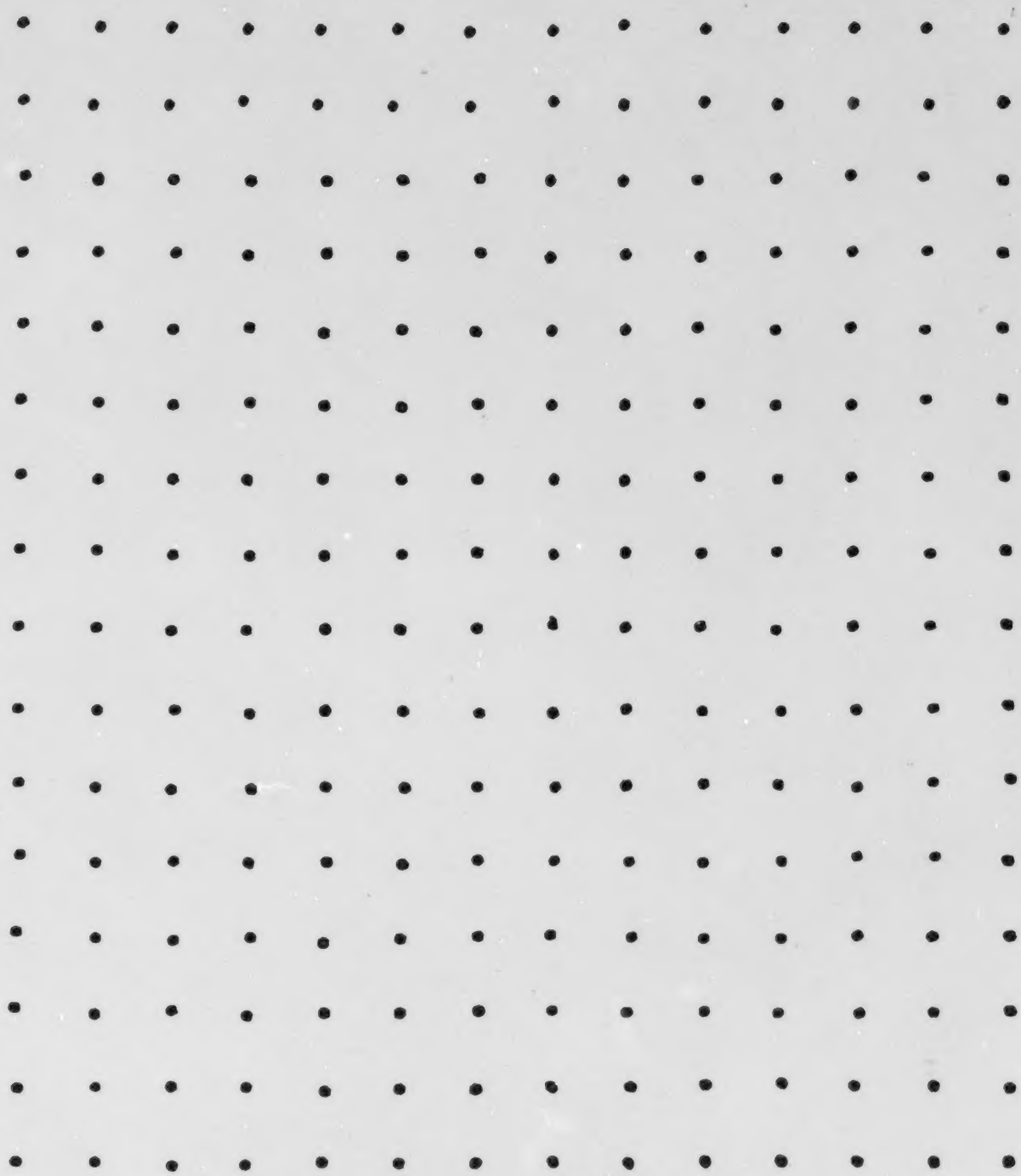
Level 6.2

1. Make a circle and count how many points make up that circle.

2. Make a circle with one diameter and one radius. Measure both the diameter and radius and see how long one is in comparison to the other.

# GEO-PAPER

Geo-paper can be used instead of geo-boards to complete the following geo-board worksheets.

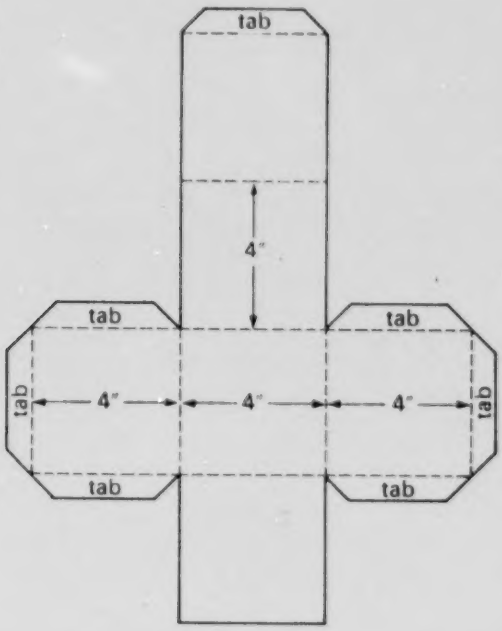


# CONSTRUCTION PATTERNS

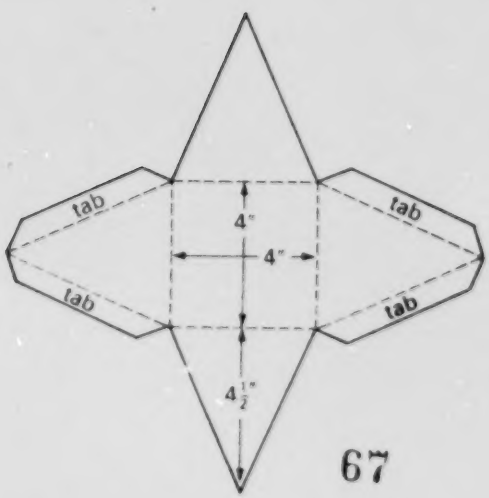
Directions:

1. On a piece of construction paper, copy the pattern for one of the geometric figures below using the given dimensions. (Keep all tabs ½" wide.)
2. Cut out the patterns along the solid lines.
3. Fold and crease the pattern along the dotted lines and glue or tape the tabs to form models of the figure.

CUBE:

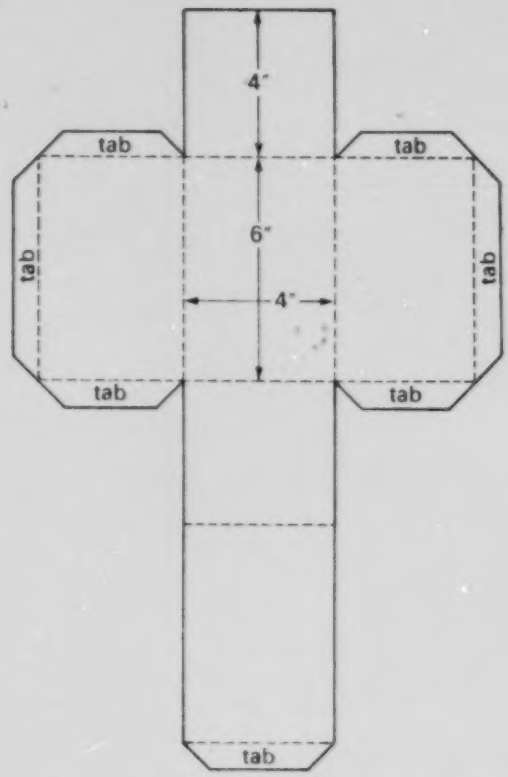



SQUARE PYRAMID:

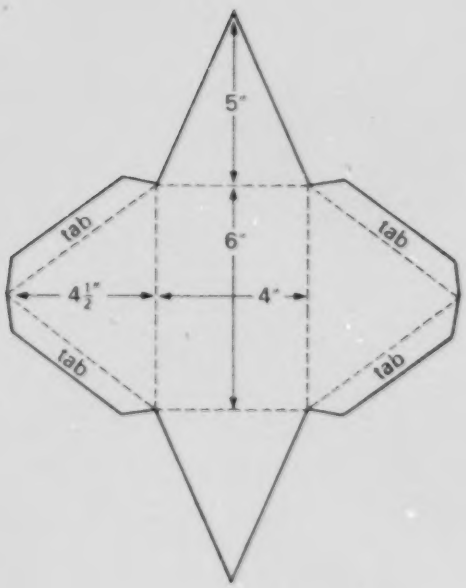


CONSTRUCTION PATTERNS - cont.

RECTANGULAR PRISM:

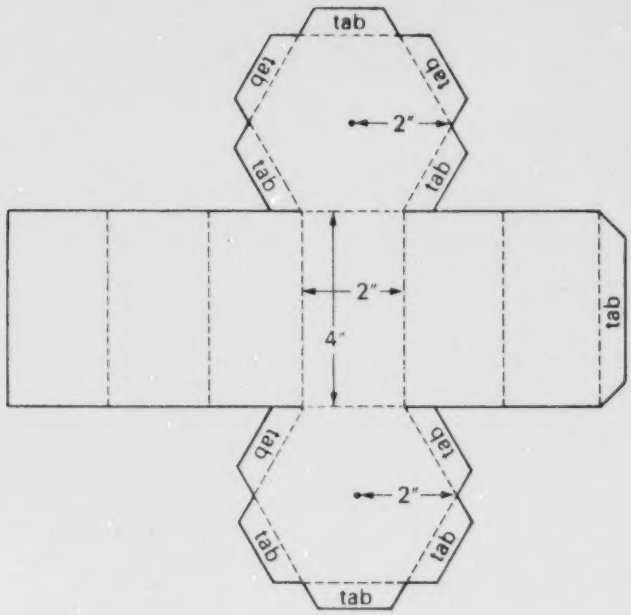



RECTANGULAR PYRAMID:

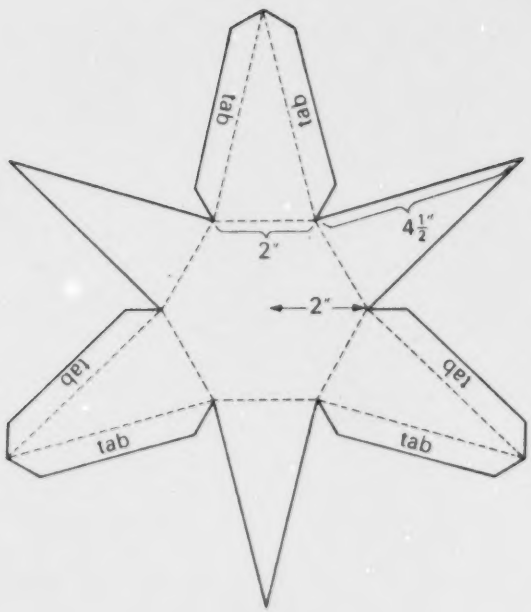


CONSTRUCTION PATTERNS - cont.

HEXAGONAL PRISM:

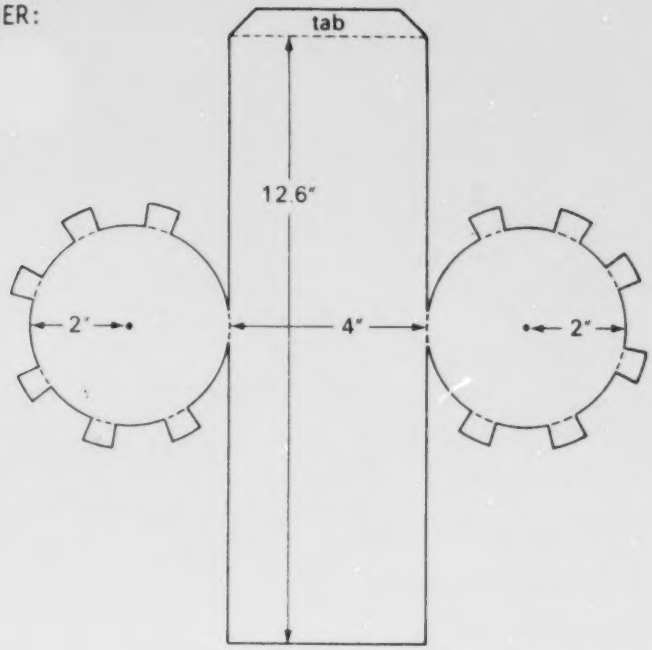



HEXAGONAL PYRAMID:

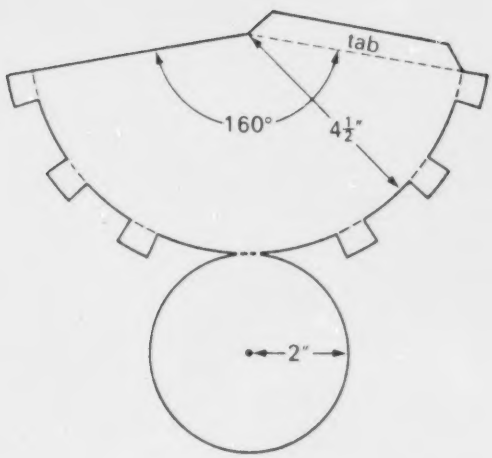


CONSTRUCTION PATTERNS - cont.

RIGHT CIRCULAR CYLINDER:




RIGHT CIRCULAR CONE:




70

# APPENDIX

# B

GEOMETRIC MYSTERY BOX - PAGE 87
GEO-HUNT - PAGE 87
ENGINEER - PAGE 87
GEO-MATCH - PAGES 87-93
GEO-BINGO - PAGES 95-174
GEOMETRIC MAZE PUZZLE - PAGES 175-176
MATERIALS FOR FLIP, TURN AND SLIDE - PAGES 175,179-181
TAN-O-GRAM PUZZLES - PAGES 175,183-185

Geometric Mystery Box

Make a box completely enclosed except for a hole in one side. The hole should be big enough for a child to reach his arm into it and pick up a geometric solid. After picking up the solid have the child describe it and give the correct name. If the child does not know the name someone else in the group may want to tell him the correct name. If none of the children know what it is they should refer to the appropriate vocabulary list to find out what it is. If a child gets the correct answer he/she may keep the solid. When all the solids have been picked they can be totaled up and the child with the most wins the game.

Geo-Hunt

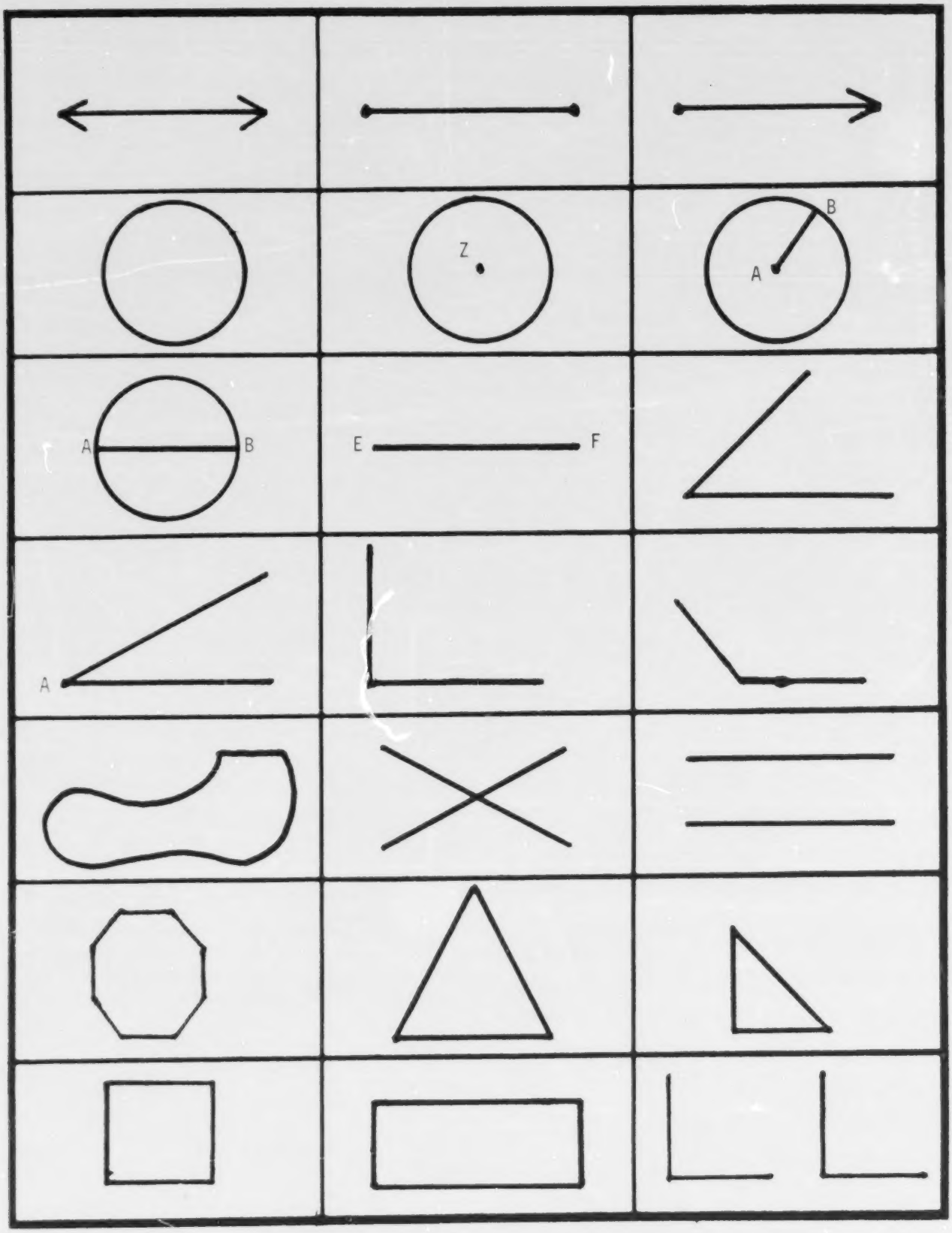
Have the students form teams with two to eight players on each team. Appoint or elect a secretary who will record all the shapes that are found. Each group is given a name (geometric shape), then the whole group looks for objects around the school that are the same shape (example: circle -- clock). After all lists have been collected the groups should make sure that the lists are correct. The team with the most objects on their list wins. Switch team names (geometric shape) with the other groups and play again.

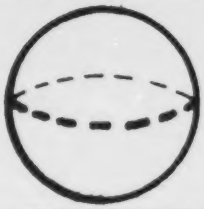
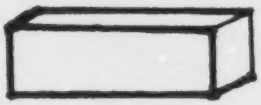
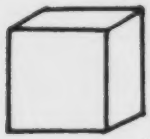
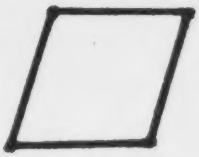
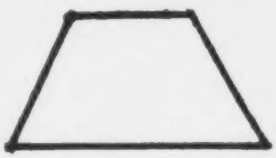
Engineer

Any amount of players are possible for this activity. Have the students line up as many chairs as there are students. Select one child as the engineer. That child stands behind the student sitting in the last chair in line. Using flash cards, such as the call cards for Geo-Bingo, flash a picture. If the person in the chair answers correctly before the person who is standing behind him (the engineer) then he/she becomes the new engineer and the old engineer takes the chair. If a person goes through the whole line without having to sit down then he/she becomes the chief engineer.

Geo-Match

A set of blue cards with shapes and the matching words are used in this activity. The cards consist of some very basic geometric concepts. Place all the cards face down and try to match the name with the most accurate shape. The child with the most matches will win the game. Again, if the children do not know the name of the picture the vocabulary lists should be used.


Z
B
A
A
B
E
F
A

| | | |
|---|---|---|
| | |  |
| |  |  |
| |  | |
|  | | Turn |
| Sphere | Cone | Rectangular Prism |
| Cube | Perpendicular Lines | Rhombus |
| Parallelogram | Trapezoid | Slide |

| | | |
|---|---|---|
| Line | Line Segment | Ray |
| Circle | Center Z | Radius AB |
| Diameter AB | Endpoints EF | Angle |
| Vertex A | Right Angle | Obtuse Angle |
| Flip | Curve | Intersection |
| Parallel Lines | Polygon | Triangle |
| Right Triangle | Square | Rectangle |

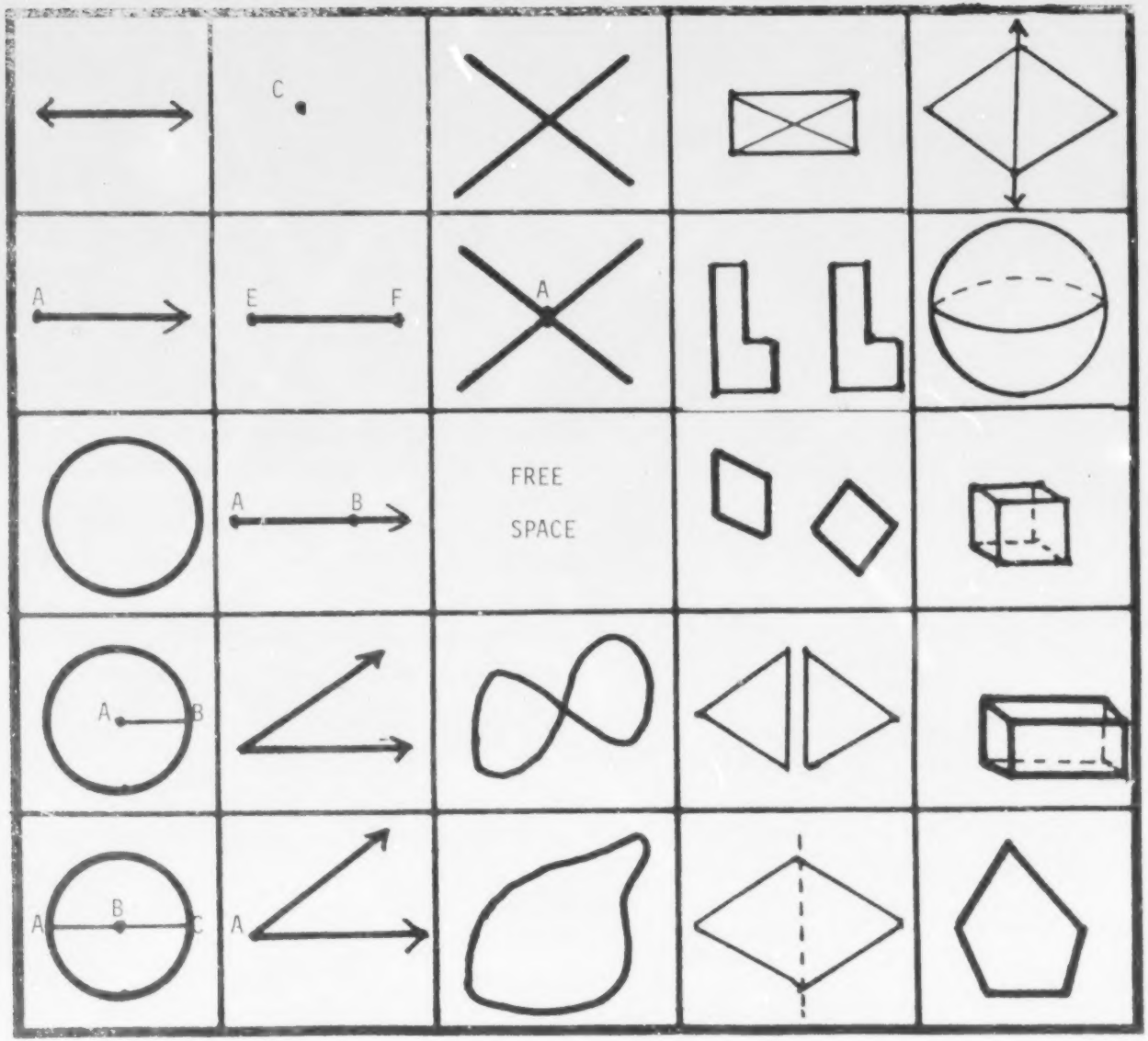
GEO-BINGO

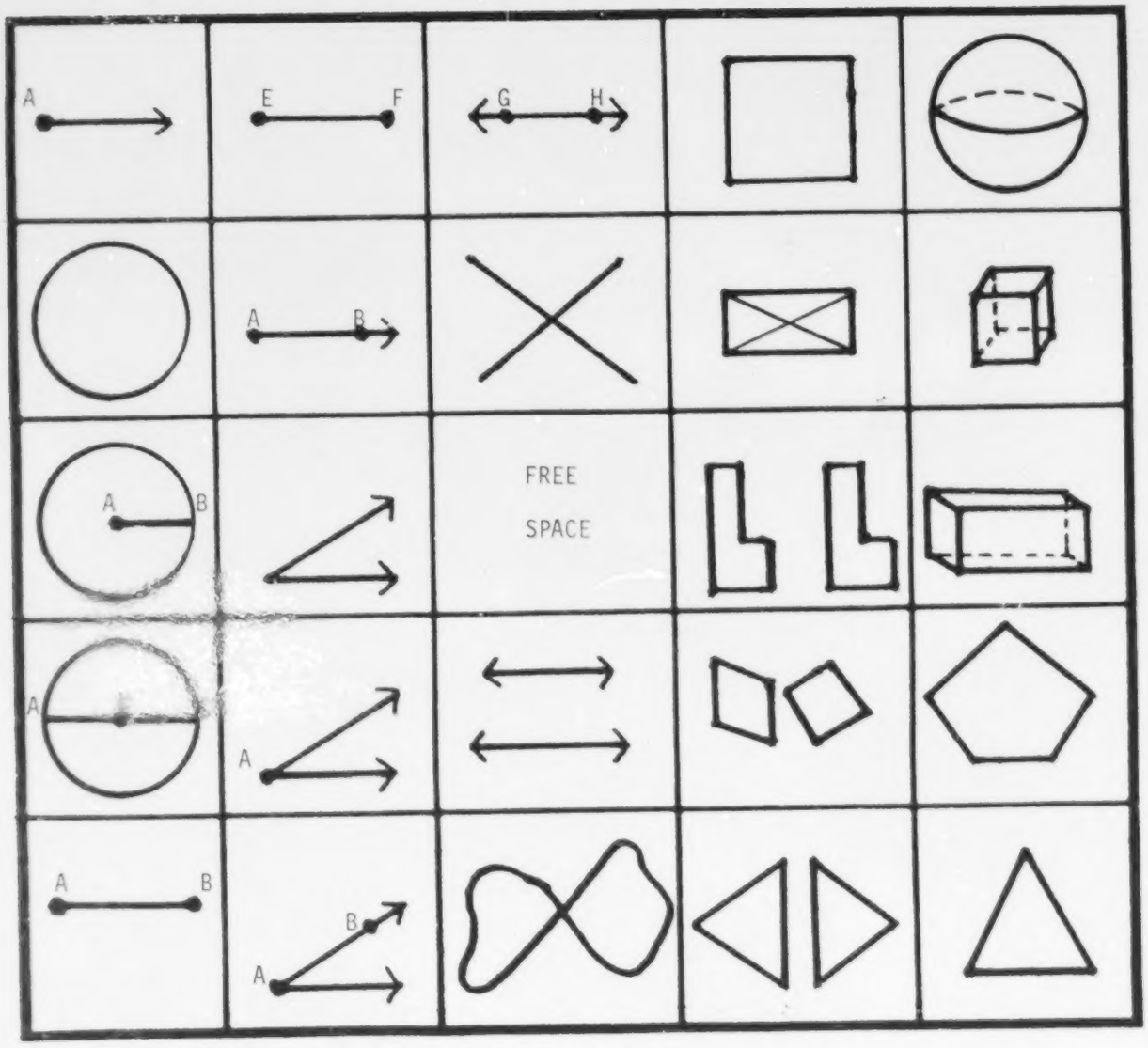
Geo-Bingo consists of three individual games that overlap somewhat yet still offer a progression of increasing difficulty. The following table is a guide to the individual games.

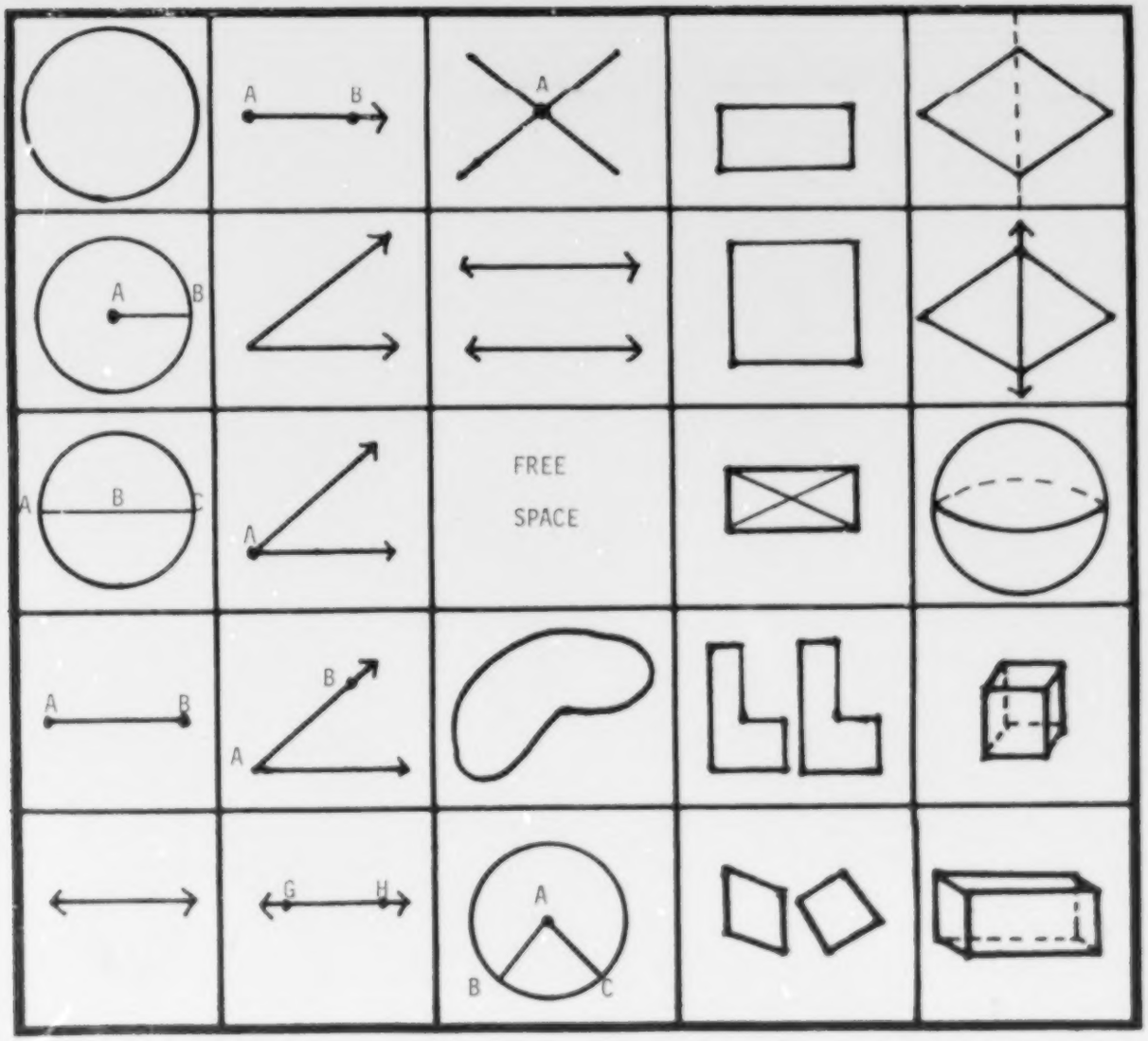
| Geo-Bingo | Card Color | Levels |
|---|---|---|
| I | Orange | 3,4a,4b |
| II | Green | 4a,4b,5a,5b |
| III | Yellow | 5a,5b,6a,6b |

Before several children play geo-bingo they should review and match all call cards with the pictures on the bingo cards. This way many questions may be eliminated when it comes time to play geo-bingo.

Appendix B includes six bingo cards at each level and approximately 125 call cards for each level. On the back of each call card is a picture which matches the correct picture on the bingo card. This way when bingo is called, simply check the call cards to make sure all answers are correct.


C
A
E
F
A
A
B
FREE
SPACE
A
B
A
B
C
A

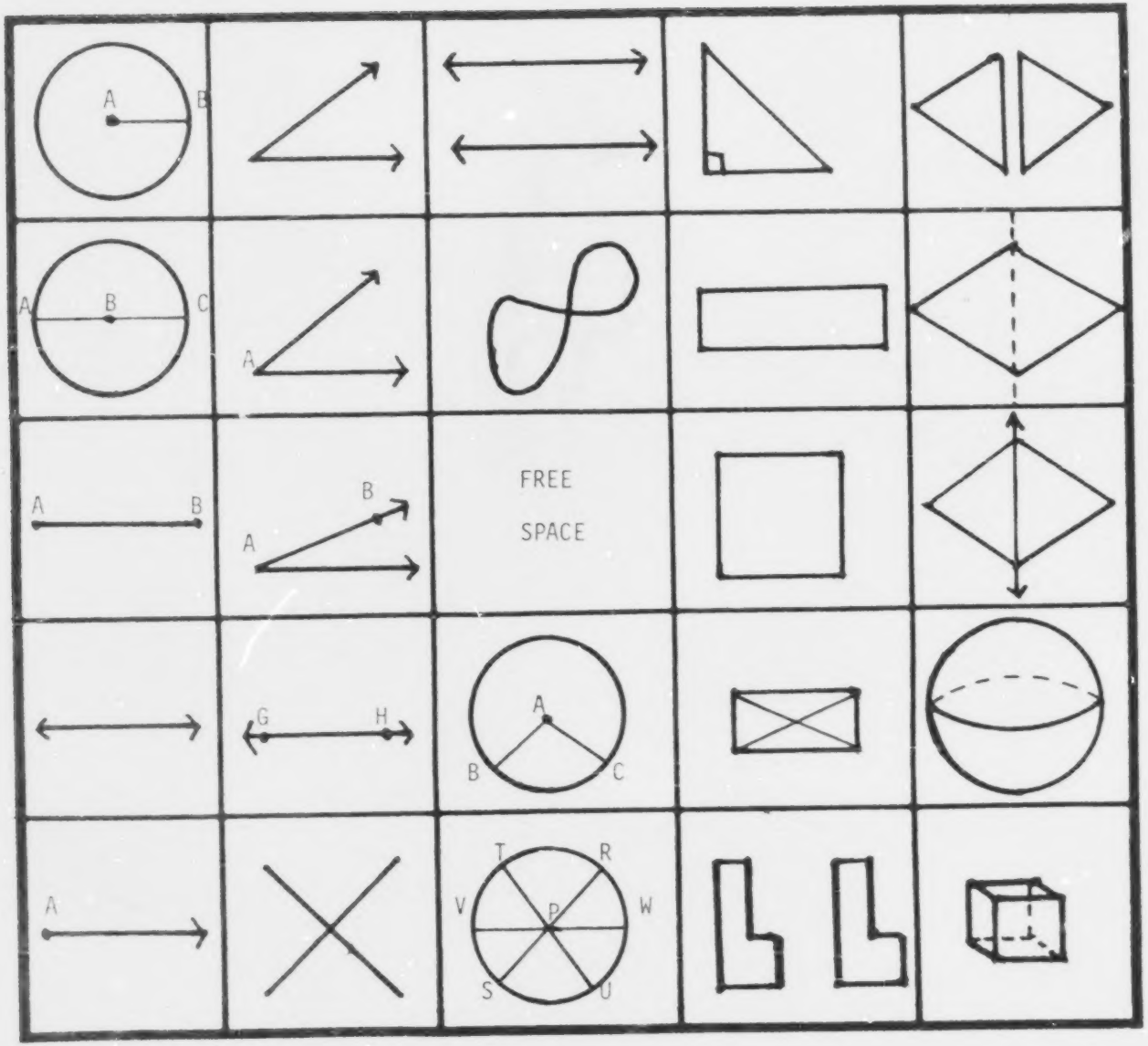

A
E
F
G
H
A
B
A
B
FREE
SPACE
A
A
B
A
B

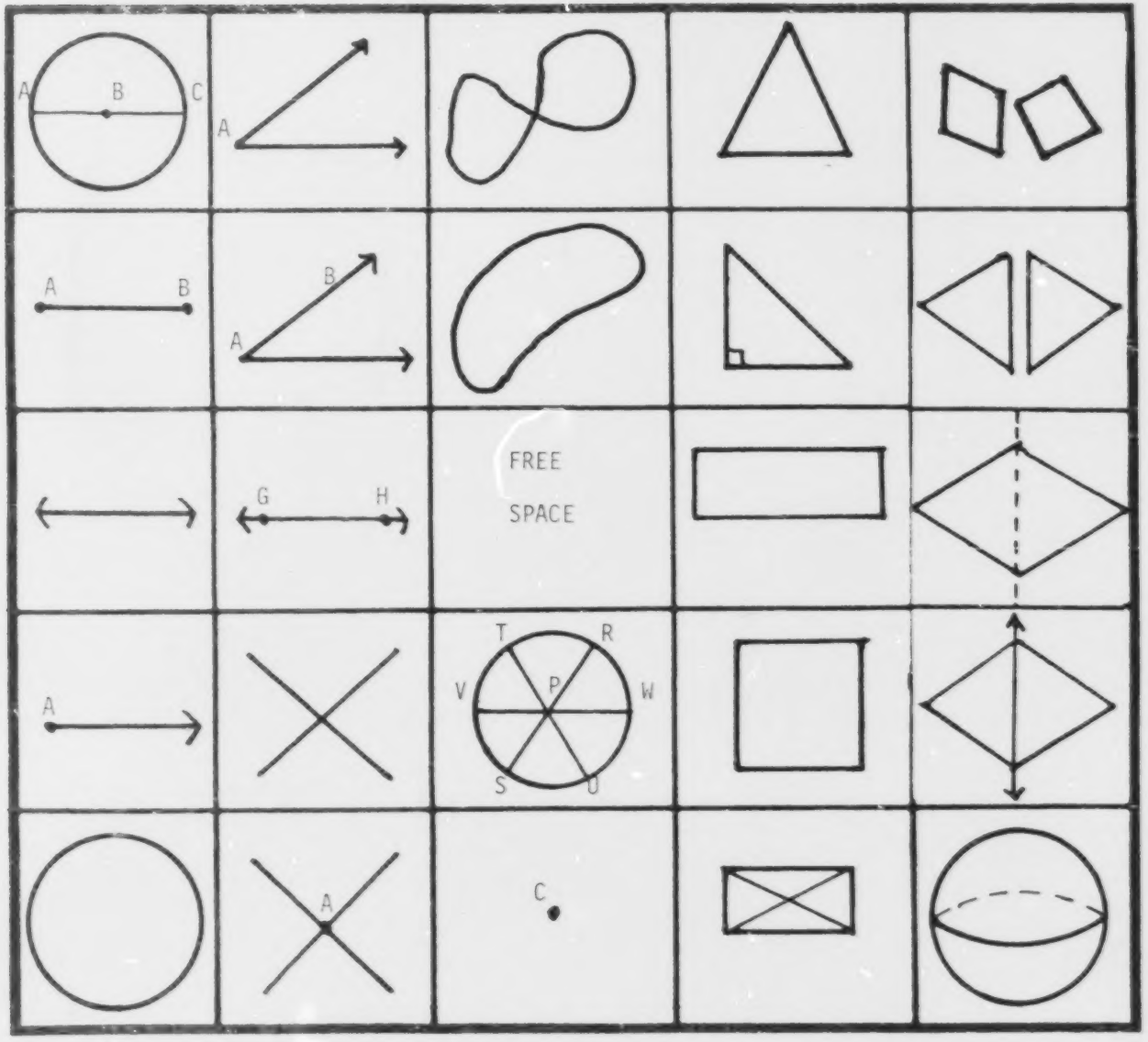


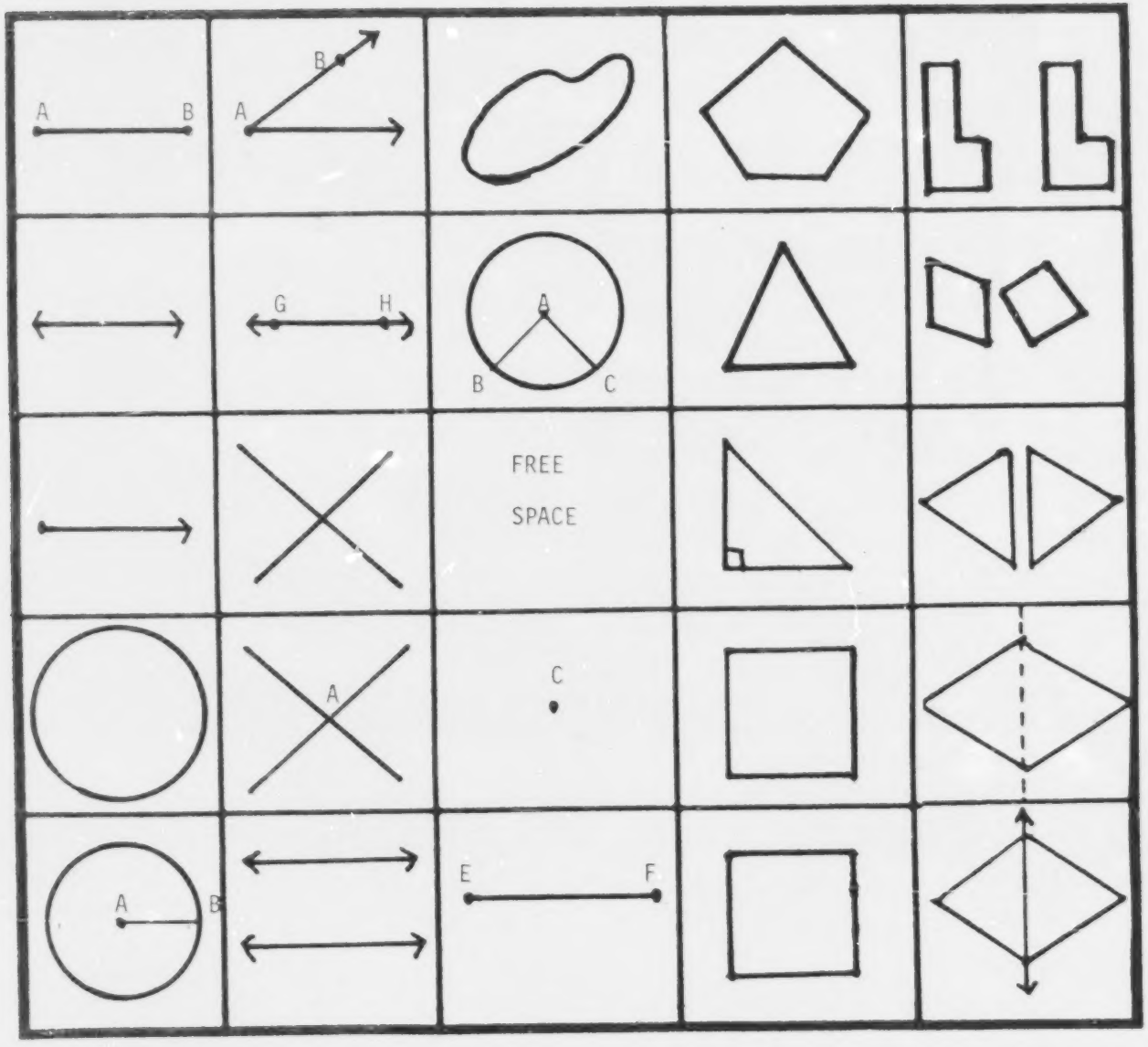



81

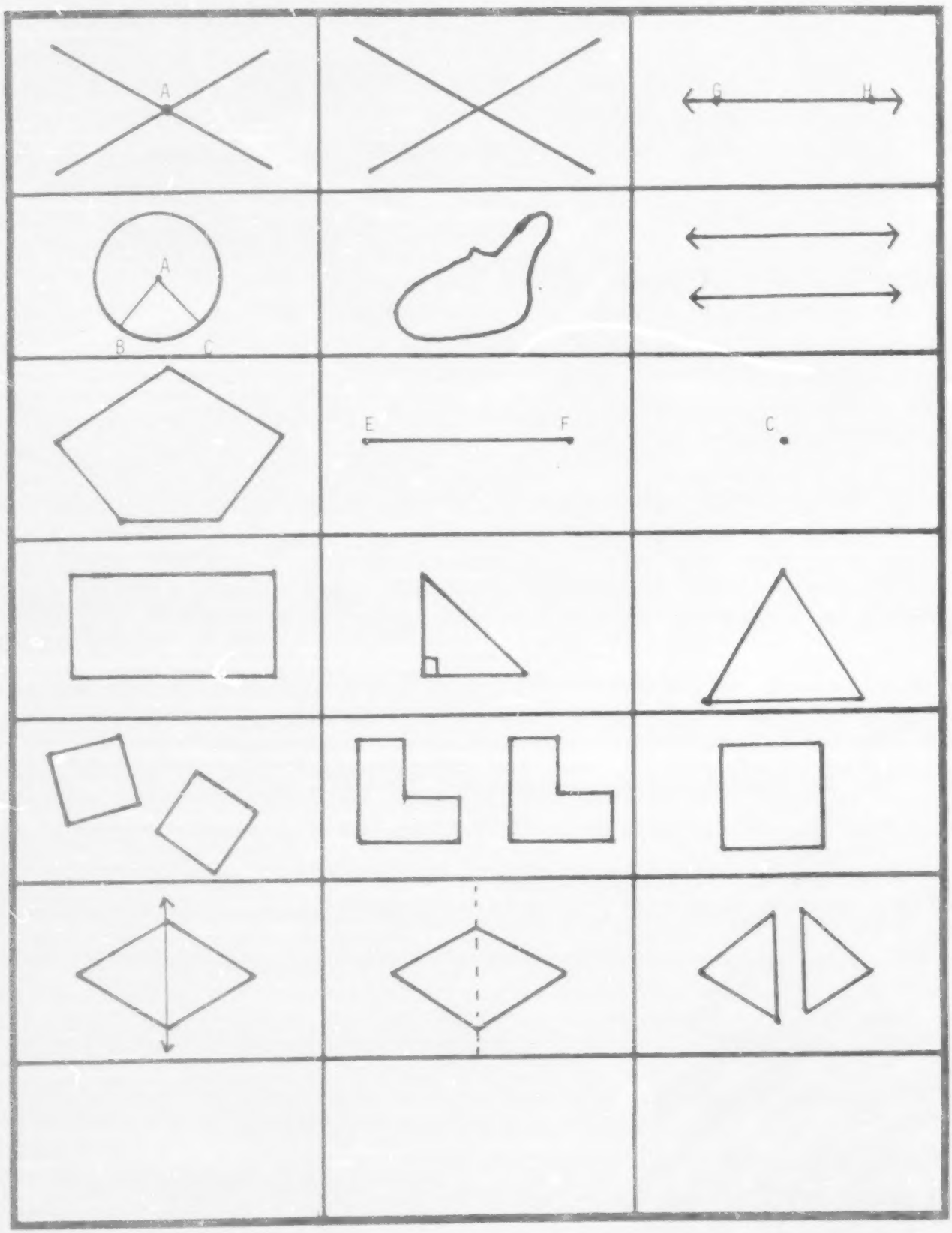
82


A
B
A
B
C
A
A
B
FREE
SPACE
G
H
A
B
C
A
T
R
V
P
W
S
U

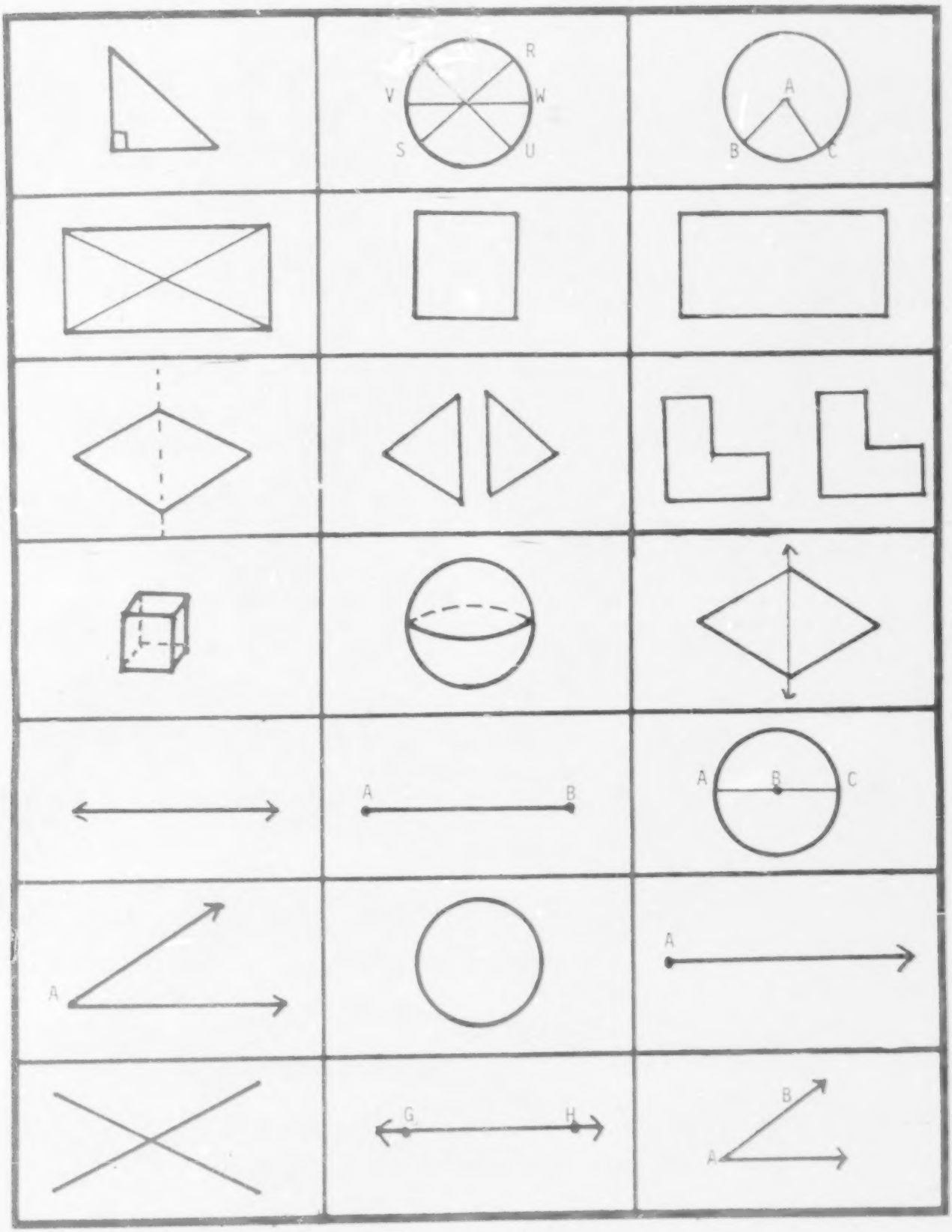

A
B
C
A
B
A
B
A
FREE
SPACE
G
H
A
T
R
V
P
W
S
U
A
C


A
B
A
B
G
H
A
B
C
FREE
SPACE
C
A
A
B
E
F

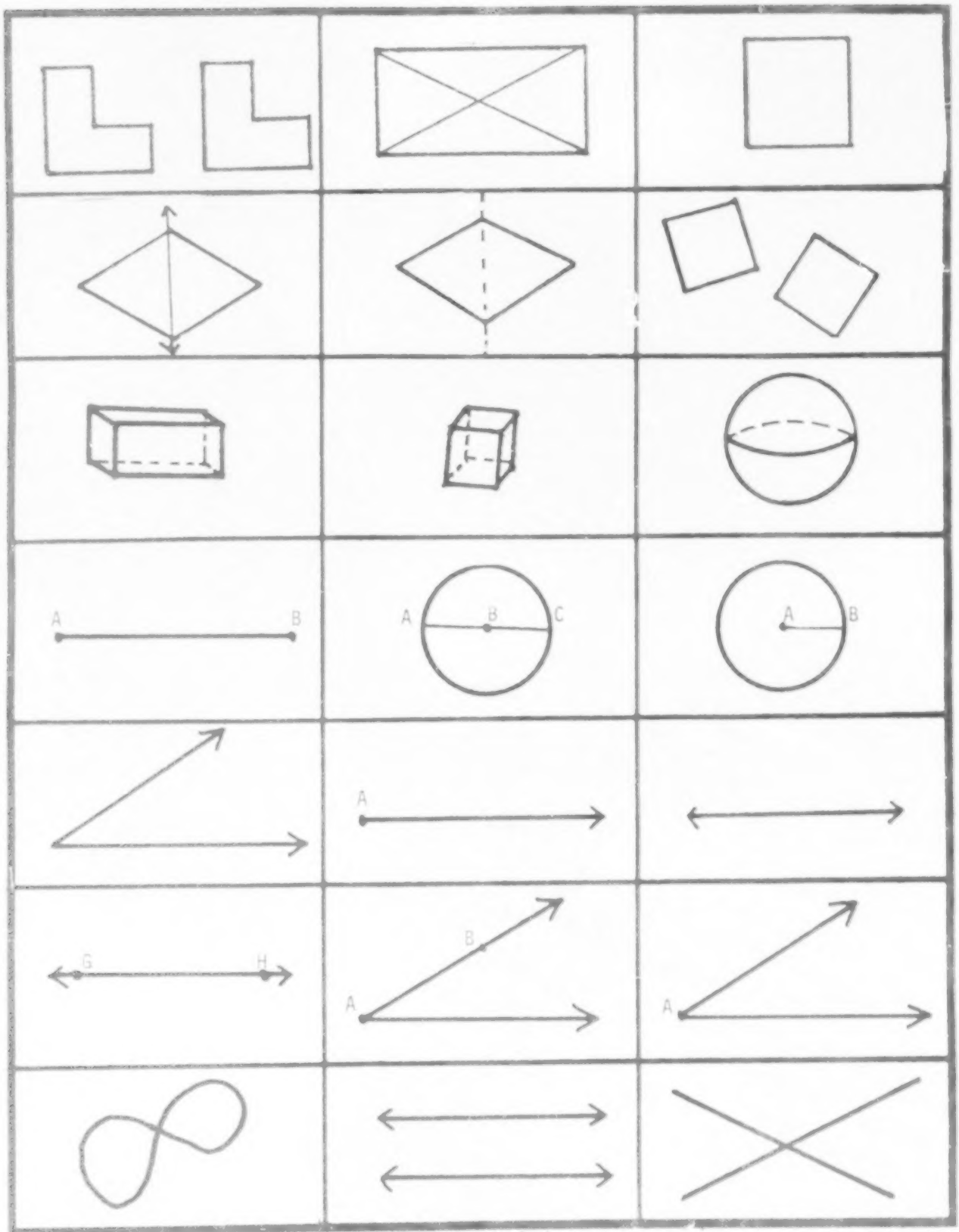
| | | |
|---|---|---|
| I-2<br>LINE GH | I-3<br>INTERSECTION | I-4<br>COMMON POINT |
| I-5<br>PARALLEL LINES | N-1<br>SIMPLE CLOSED CURVE | N-2<br>RADII AB AND AC |
| N-4<br>POINT | N-5<br>ENDPOINTS EF | G-1<br>POLYGON |
| G-2<br>TRIANGLE | G-3<br>RIGHT TRIANGLE | G-4<br>RECTANGLE |
| G-5<br>SQUARE | O-1<br>SLIDE | O-2<br>TURN |
| O-3<br>FLIP | O-4<br>SYMMETRIC FIGURE | O-5<br>LINE OF SYMMETRY |


A
G
H
A
B
C
E
F
C

| | | |
|---|---|---|
| N-4 | N-5 | G-1 |
| RADII AB AND AC | DIAMETERS RS, TU, VW | RIGHT TRIANGLE |
| G-2 | G-3 | G-4 |
| RECTANGLE | SQUARE | DIAGONALS |
| G-5 | O-1 | O-2 |
| SLIDE | FLIP | SYMMETRIC FIGURE |
| O-3 | O-4 | O-5 |
| LINE OF SYMMETRY | SPHERE | CUBE |
| B-1 | B-2 | B-3 |
| DIAMETER AC | LINE SEGMENT AB | LINE |
| B-4 | B-5 | I-1 |
| RAY | CIRCLE | VERTEX A |
| I-2 | I-3 | I-4 |
| SIDE AB | LINE GH | INTERSECTION |


R
V
W
S
U
A
B
C
A
B
A
B
C
A
A
G
H
B
A

| | | |
|---|---|---|
| G-2 | G-3 | G-4 |
| SQUARE | DIAGONALS | SLIDE |
| G-5 | O-1 | O-2 |
| TURN | SYMMETRIC FIGURE | LINE OF SYMMETRY |
| O-3 | O-4 | O-5 |
| SPHERE | CUBE | RECTANGULAR PRISM |
| B-1 | B-2 | B-3 |
| RADIUS AB | DIAMETER AC | LINE SEGMENT |
| B-4 | B-5 | I-1 |
| LINE | RAY | ANGLE |
| I-2 | I-3 | I-4 |
| VERTEX A | SIDE AB | LINE GH |
| I-5 | N-1 | N-2 |
| INTERSECTION | PARALLEL LINES | CLOSED CURVE |




94

G-5

SYMMETRIC FIGURE

O-1

LINE OF SYMMETRY

O-2

SPHERE

O-3

CUBE

O-4

RECTANGULAR PRISM

O-5

POLYGON

B-1

CIRCLE

B-2

RADIUS AB

B-3

DIAMETER AC

B-4

LINE SEGMENT AB

B-5

LINE

I-1

RAY AB

I-2

ANGLE

I-3

VERTEX A

I-4

SIDE AB

I-5

LINE GH

N-1

COMMON POINT

N-2

PARALLEL LINES

N-4

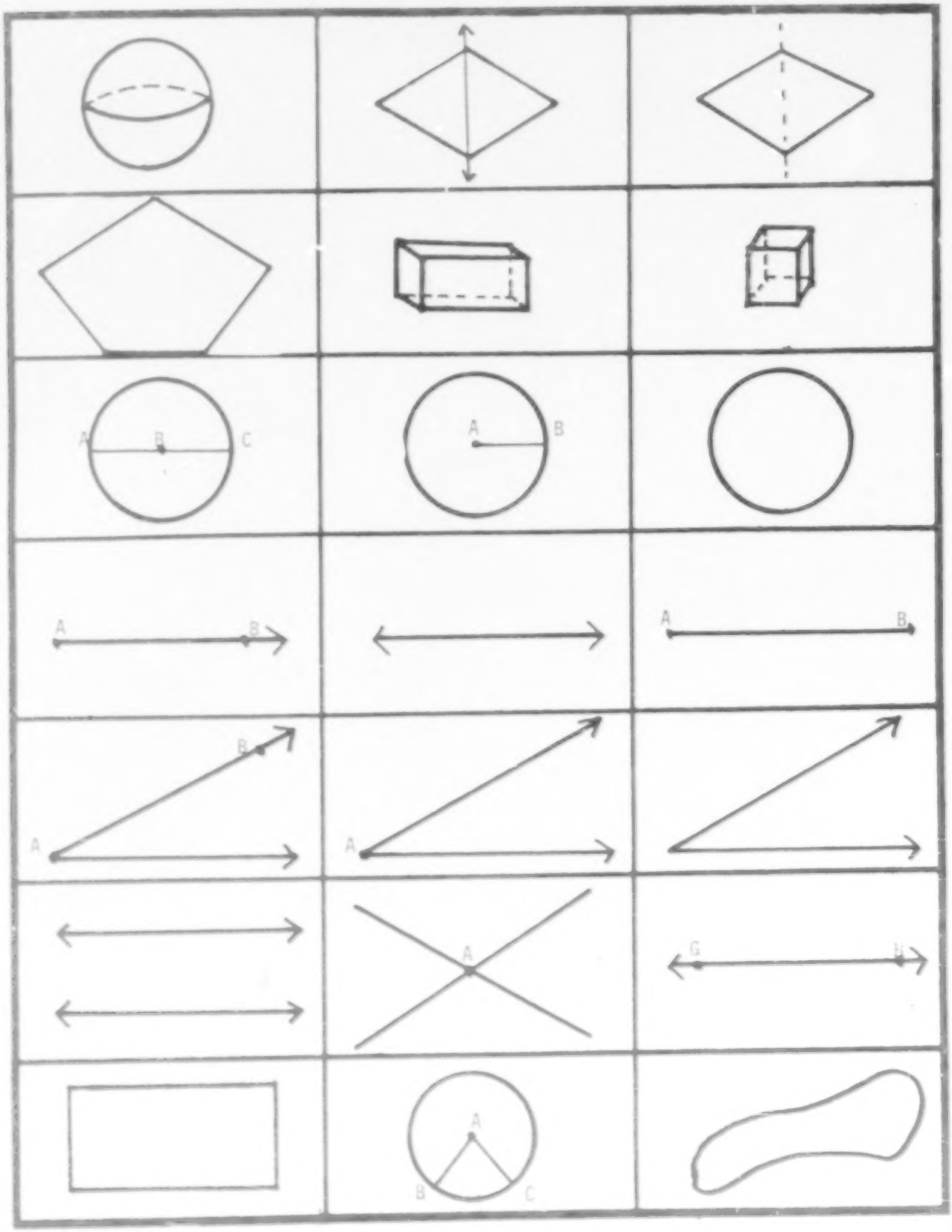
SIMPLE CLOSED CURVE

N-5

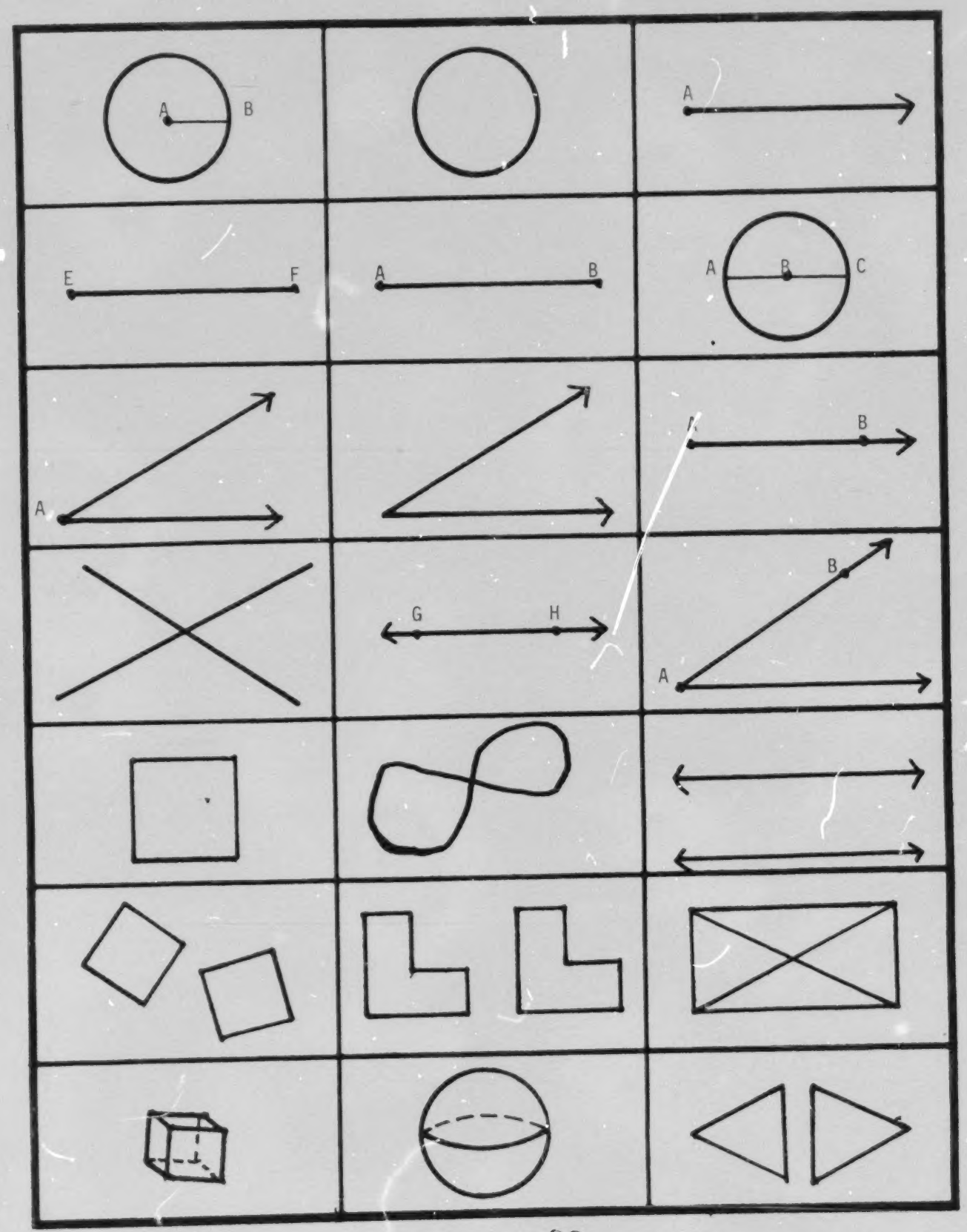
RADII AB AND AC

G-1

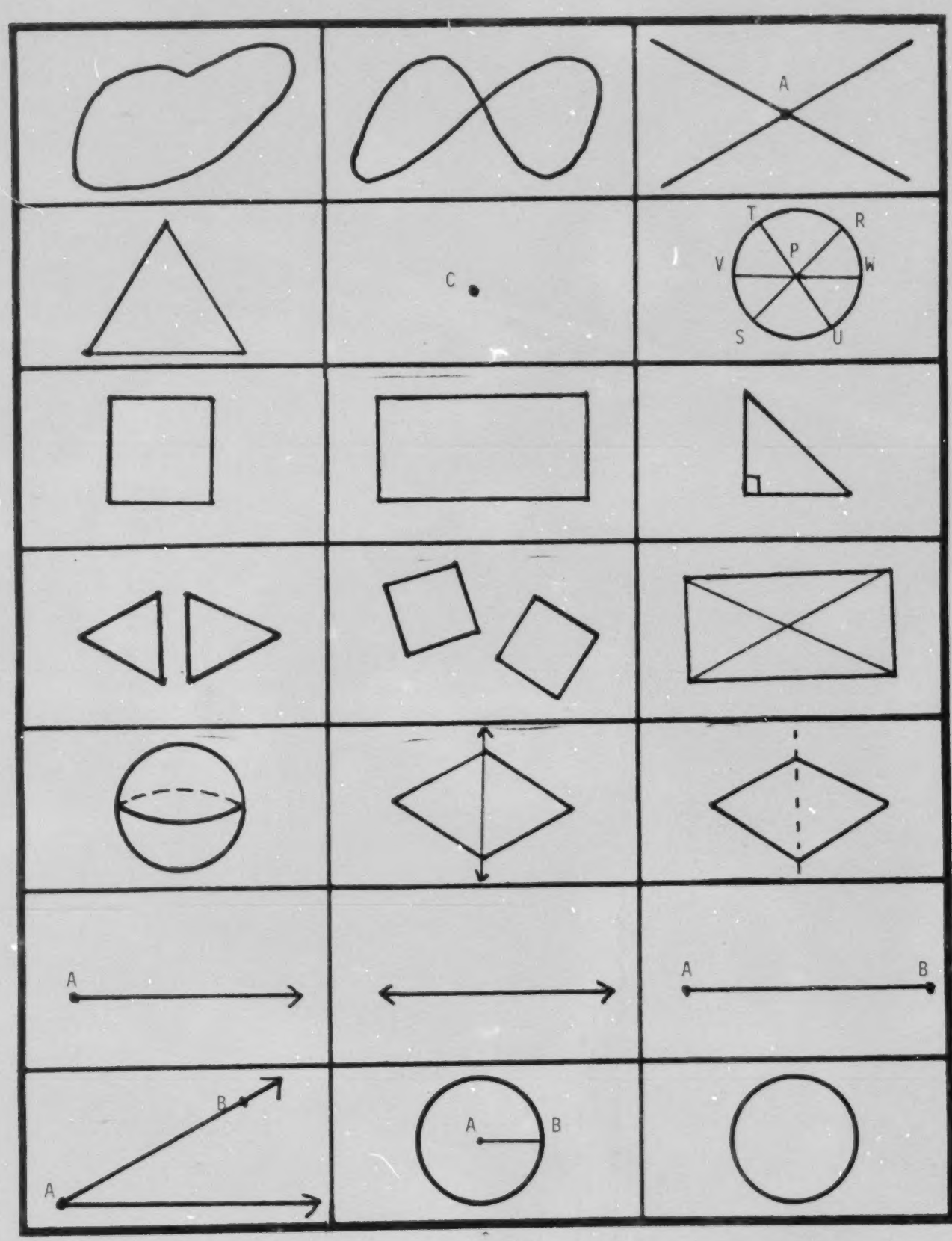
RECTANGLE


A
B
C
A
B
A
B
A
B
A
B
A
B
A
B
G
H
A
B
C

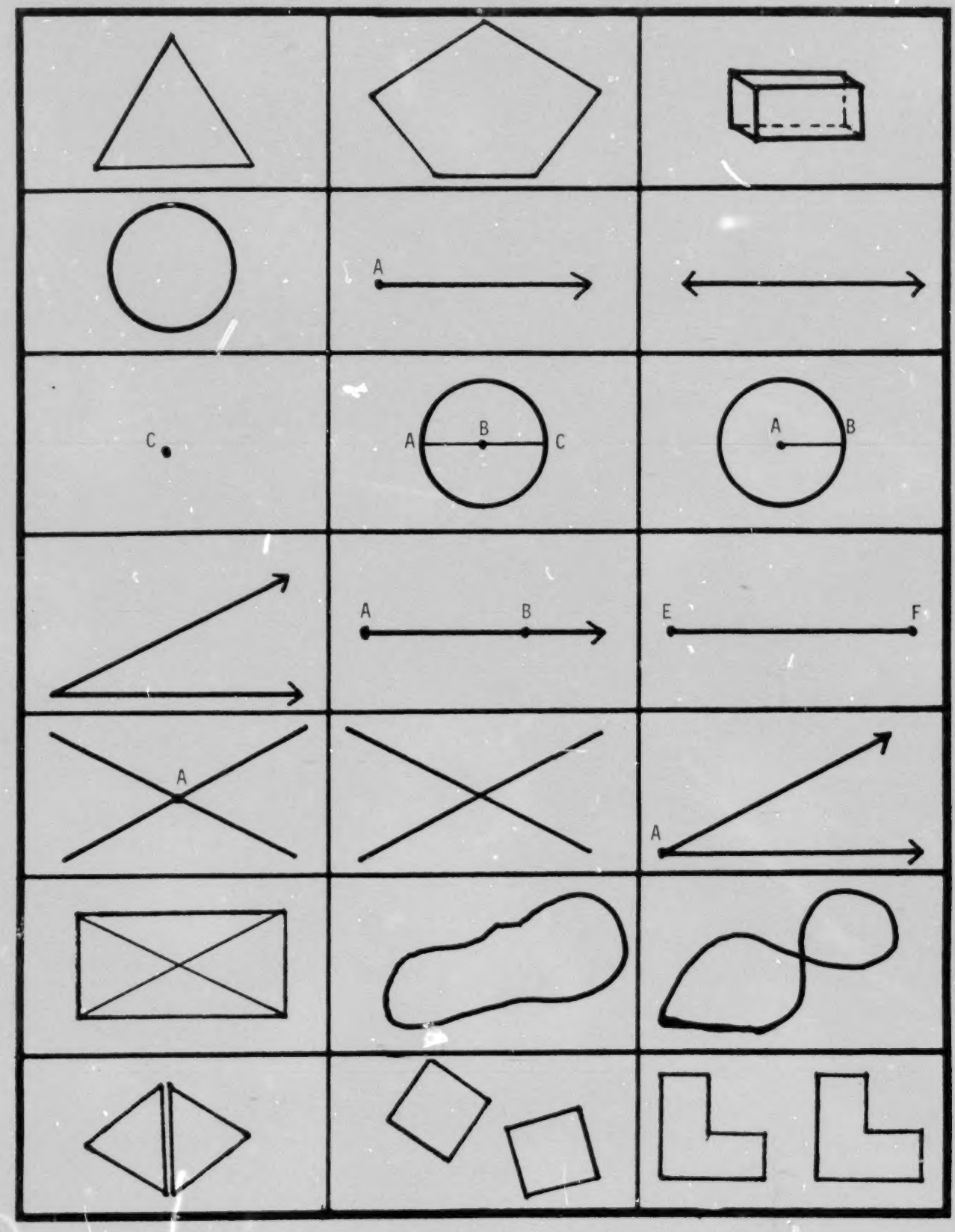
| | | |
|---|---|---|
| B-1 | B-2 | B-3 |
| A RAY | A CIRCLE | RADIUS AB |
| B-4 | B-5 | I-1 |
| DIAMETER AC | LINE SEGMENT AB | ENDPOINTS EF |
| I-2 | I-3 | I-4 |
| RAY AB | ANGLE | VERTEX A |
| I-5 | N-1 | N-2 |
| SIDE AB | LINE GH | INTERSECTION |
| N-4 | N-5 | G-1 |
| PARALLEL LINES | CLOSED CURVE | SQUARE |
| G-2 | G-3 | G-4 |
| DIAGONAL LINES | SLIDE | TURN |
| G-5 | O-1 | O-2 |
| FLIP | SPHERE | CUBE |

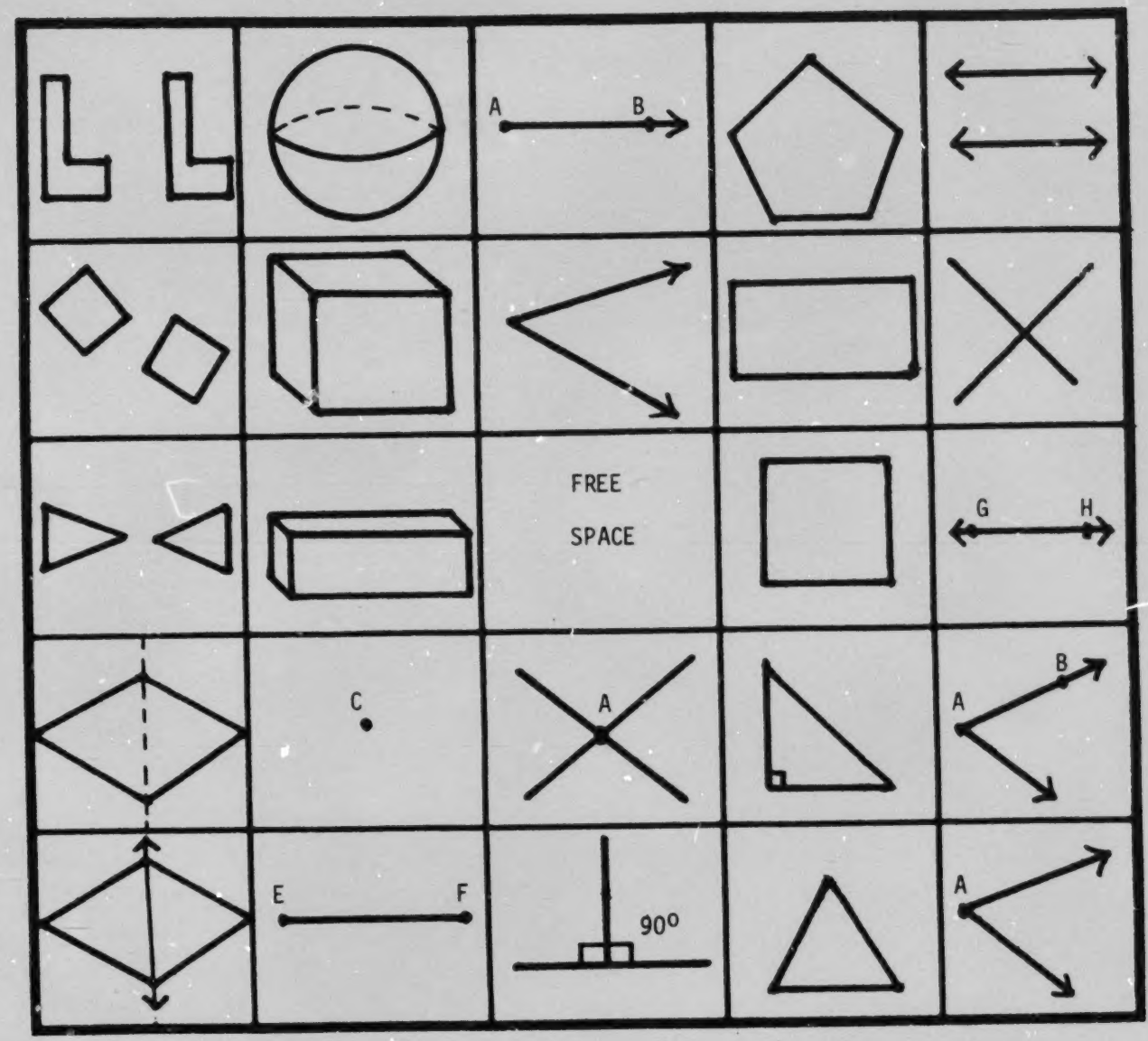

A
B
A
E
F
A
B
A
B
C
A
B
A
G
H
B
A

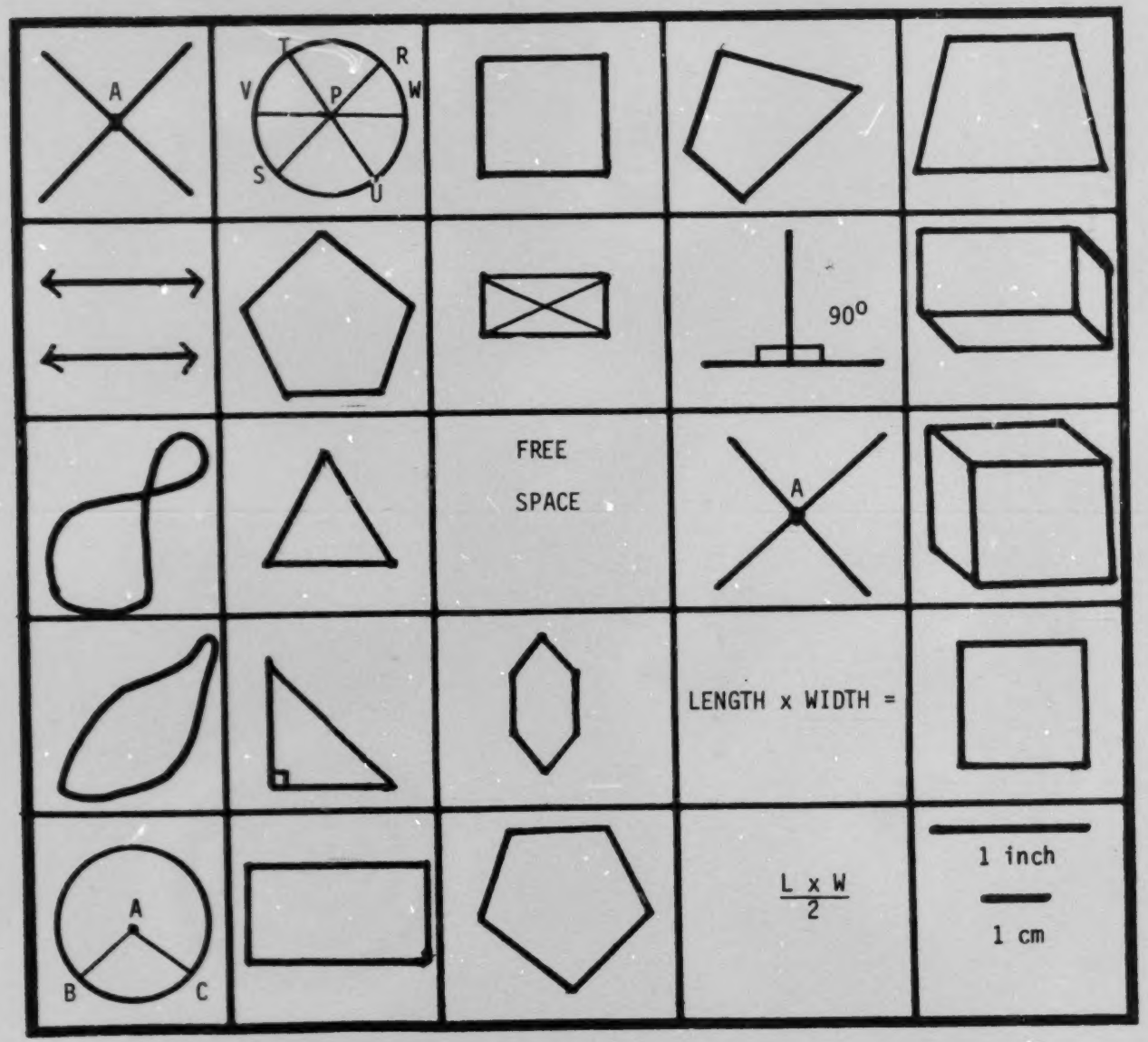
| | | |
|---|---|---|
| I-5 | N-1 | N-2 |
| COMMON POINT | CLOSED CURVE | SIMPLE CLOSED CURVE |
| N-4 | N-5 | G-1 |
| DIAMETERS RS, TU, VW | POINT | TRIANGLE |
| G-2 | G-3 | G-4 |
| RIGHT TRIANGLE | RECTANGLE | SQUARE |
| G-5 | O-1 | O-2 |
| DIAGONALS | TURN | FLIP |
| O-3 | O-4 | O-5 |
| SYMMETRIC FIGURE | LINE OF SYMMETRY | SPHERE |
| B-1 | B-2 | B-3 |
| LINE SEGMENT AB | LINE | RAY |
| B-4 | B-5 | I-1 |
| CIRCLE | RADIUS AB | SIDE AB |


A
C
T
R
P
V
W
S
U
A
B
A
B
A
B

| | | |
|---|---|---|
| O-3 | O-4 | O-5 |
| RECTANGULAR PRISM | POLYGON | TRIANGLE |
| B-1 | B-2 | B-3 |
| LINE | RAY | CIRCLE |
| B-4 | B-5 | I-1 |
| RADIUS AB | DIAMETER AC | POINT |
| I-2 | I-3 | I-4 |
| ENDPOINTS EF | RAY AB | ANGLE |
| I-5 | N-1 | N-2 |
| VERTEX A | INTERSECTION | COMMON POINT |
| N-4 | N-5 | G-1 |
| CLOSED CURVE | SIMPLE CLOSED CURVE | DIAGONALS |
| G-2 | G-3 | G-4 |
| SLIDE | TURN | FLIP |


A
C
A
B
C
A
B
A
A
B
E
F
A
A

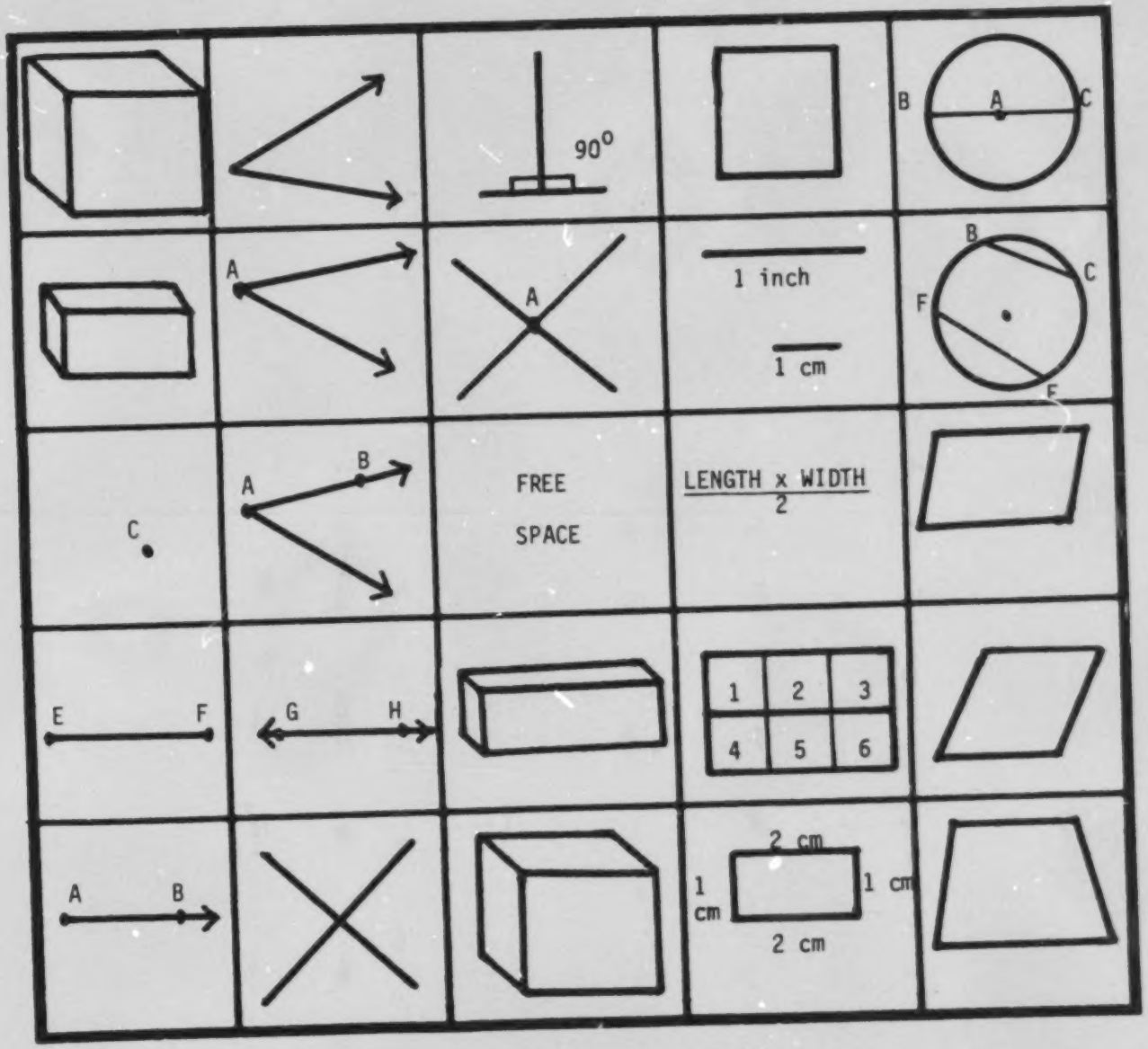

A
B
FREE
SPACE
G
H
C
A
B
A
E
F
90°
A






105

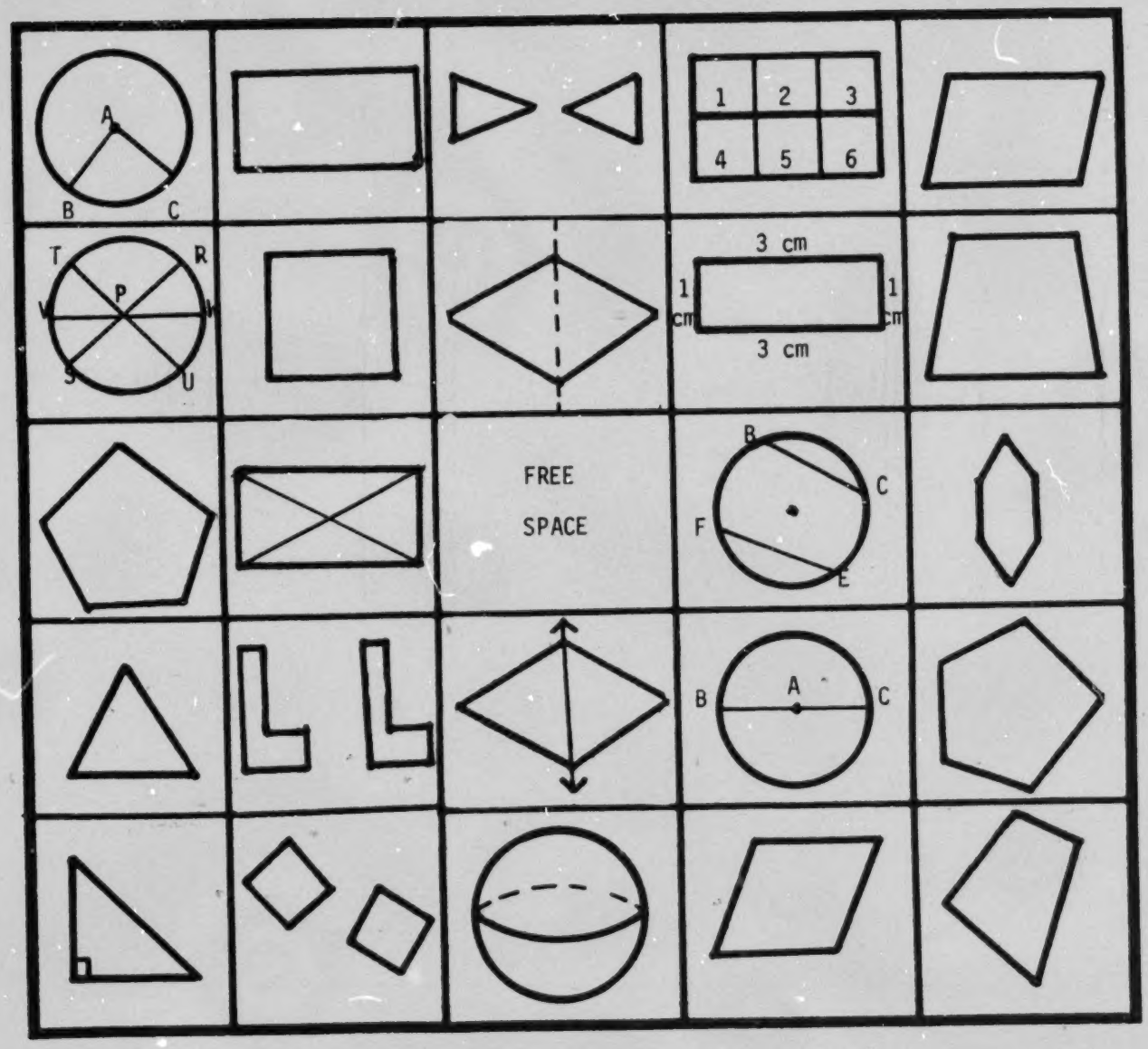
106

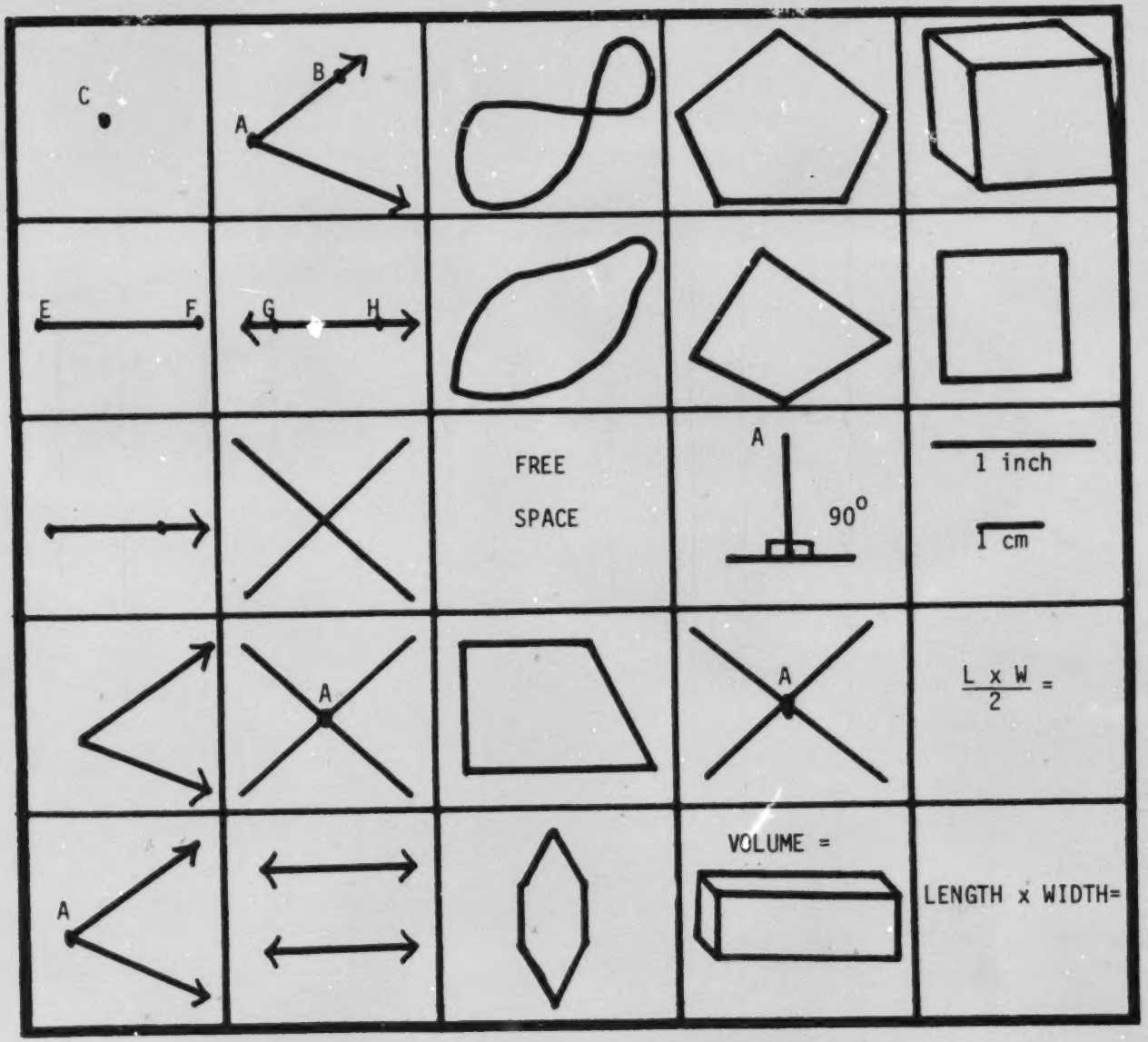

90°
B
A
C
A
A
1 inch
1 cm
B
C
F
E
C
A
B
FREE
SPACE
LENGTH x WIDTH
2
E
F
G
H
1
2
3
4
5
6
A
B
2 cm
1 cm
1 cm
2 cm

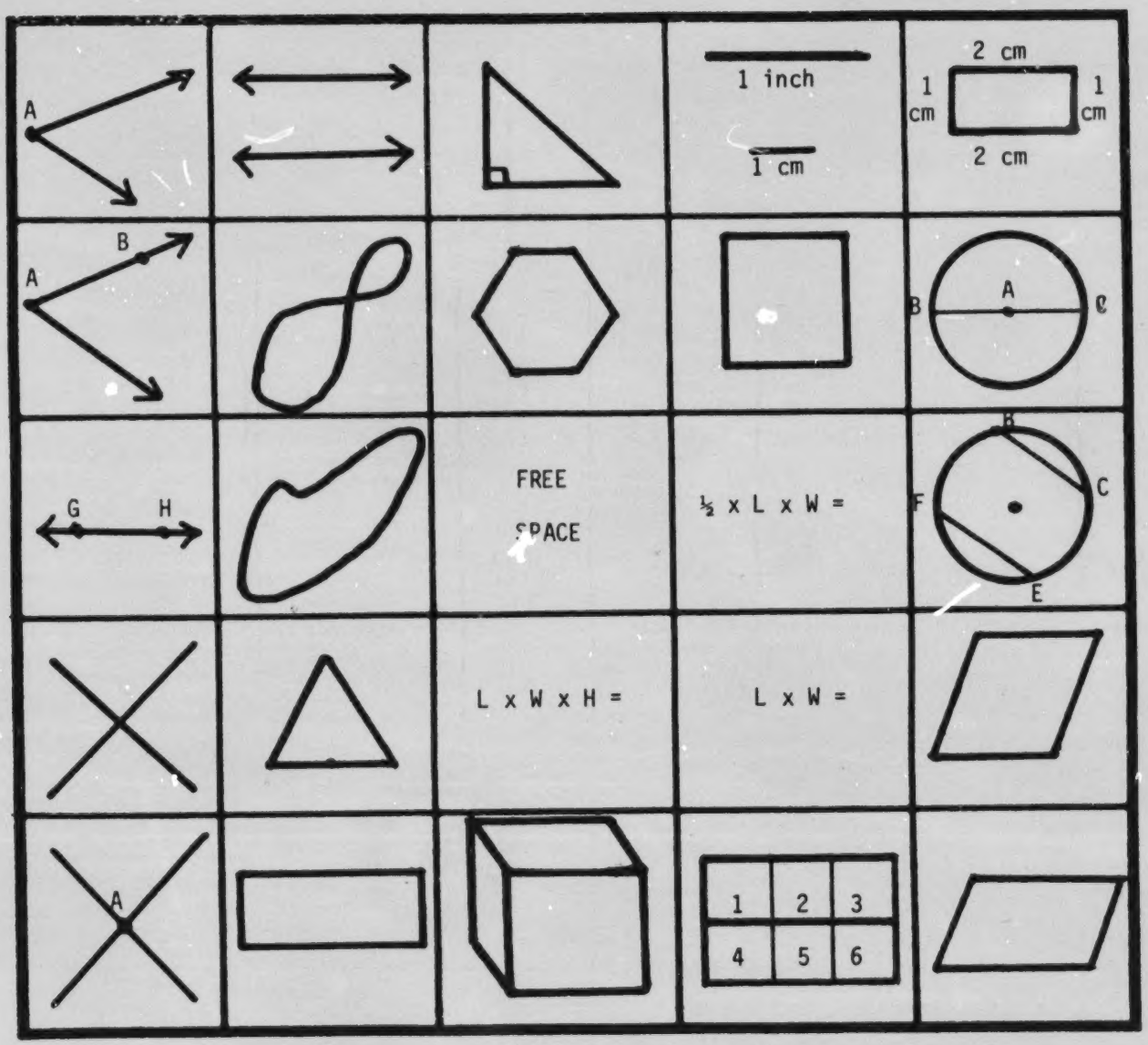
127

107

108


A
B
C
1
2
3
4
5
6
T
R
P
V
W
S
U
3 cm
1 cm
1 cm
3 cm
FREE
SPACE
B
C
F
E
B
A
C


C
B
A
E
F
G
H
FREE
SPACE
A
90°
1 inch
1 cm
A
A
$\frac{L \times W}{2}$ =
A
VOLUME =
LENGTH x WIDTH=


A
1 inch
1 cm
2 cm
1 cm
1 cm
2 cm
B
A
B
A
C
G
H
FREE
SPACE
½ x L x W =
B
F
C
E
L x W x H =
L x W =
A
1
2
3
4
5
6

O-3

CHORDS BC & FE

O-4

RHOMBUS

O-5

PARALLELOGRAM

B-1

POINT C

B-2

LINE SEGMENT EF

B-3

RAY AB

B-4

ANGLE

B-5

VERTEX A

I-1

SIDE AB

I-2

LINE GH

I-3

INTERSECTION

I-4

COMMON POINT A

I-5

PARALLEL LINES

N-1

CLOSED CURVE

N-2

SIMPLE CLOSED CURVE

N-4

TRAPEZOID

N-5

HEXAGON

G-1

PENTAGON

G-2

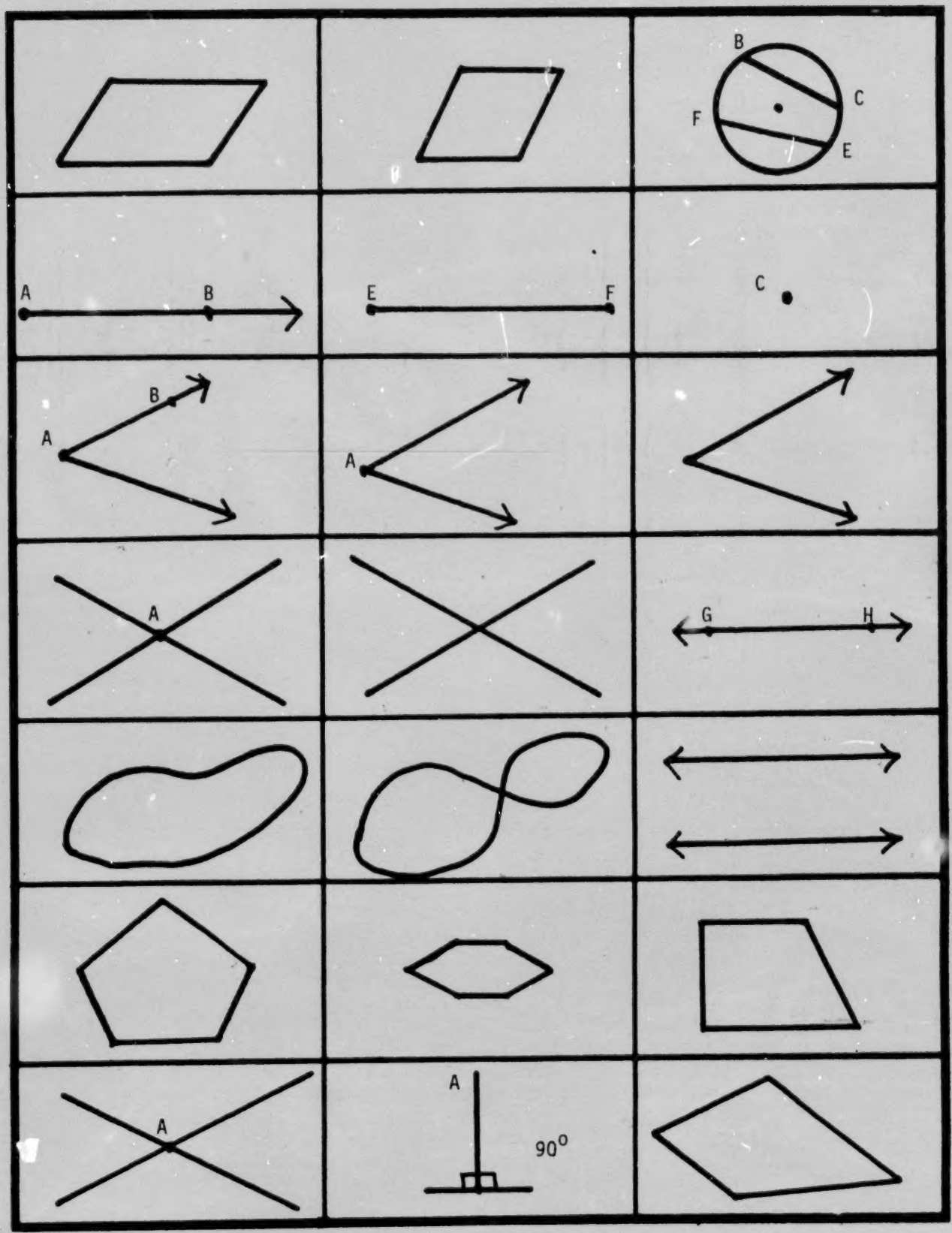
QUADRILATERAL

G-3

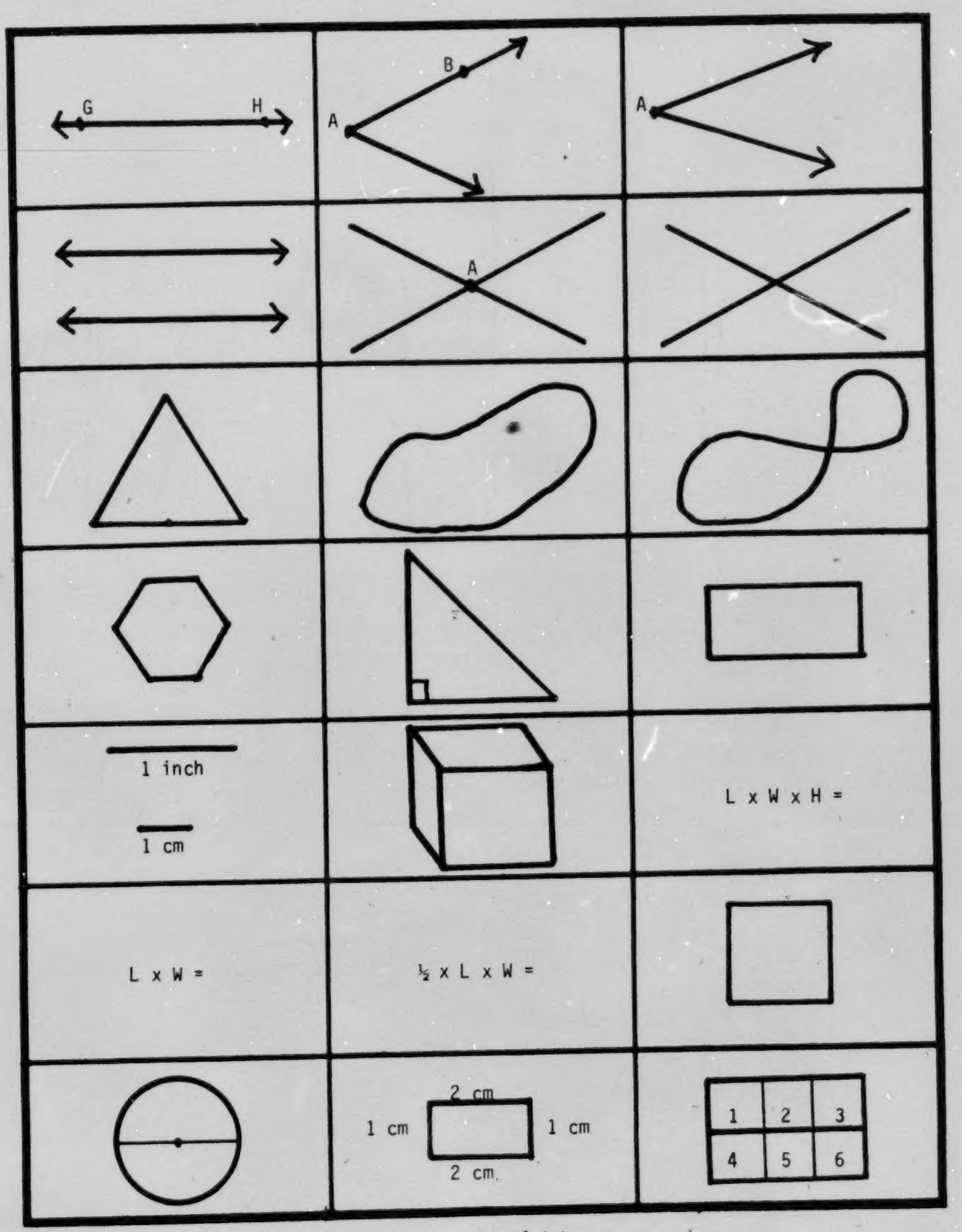
PERPENDICULAR LINES

G-4

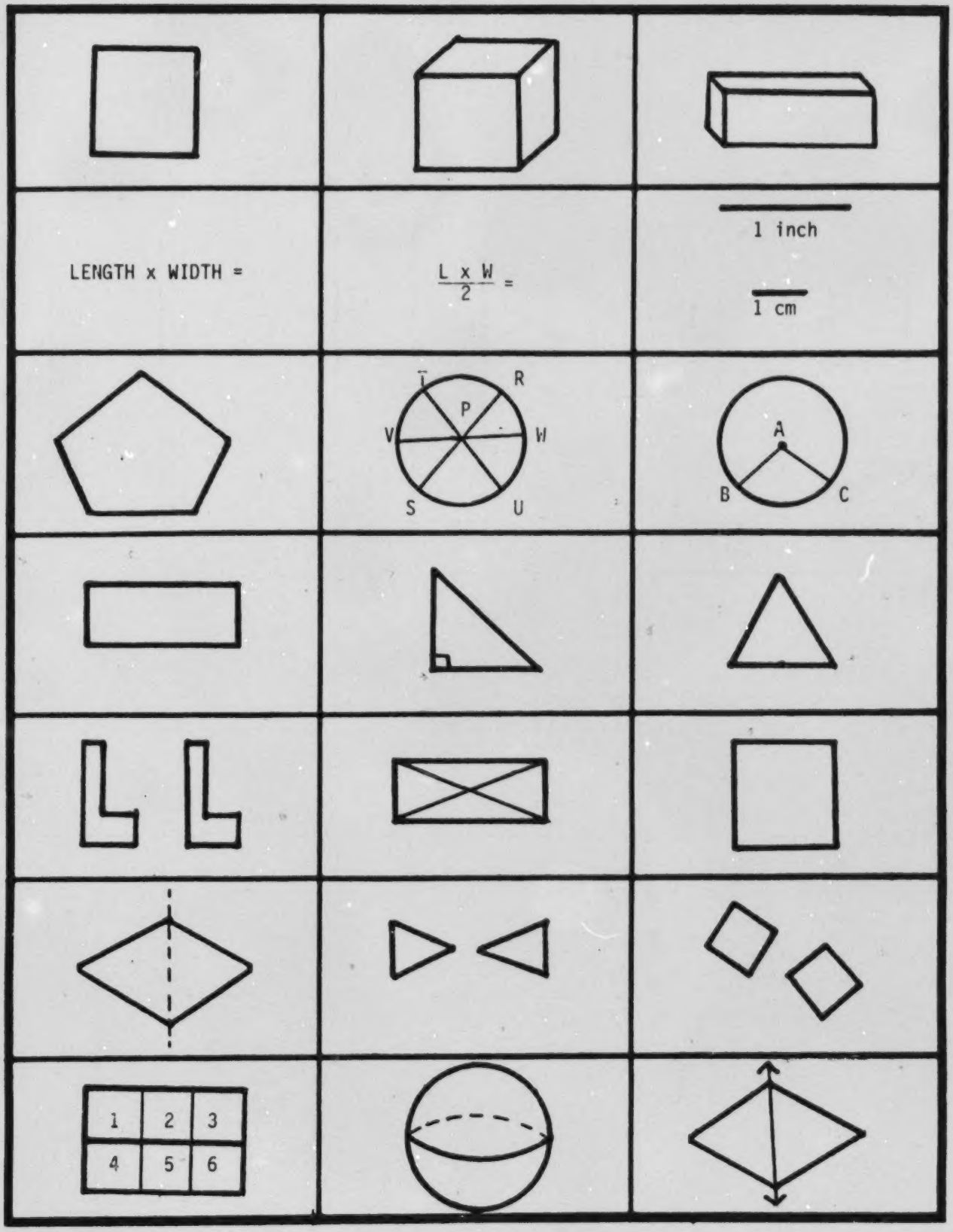
TWO LINES INTERSECT AT ONE POINT


B
C
F
E
A
B
E
F
C
B
A
A
A
G
H
A
A
90°

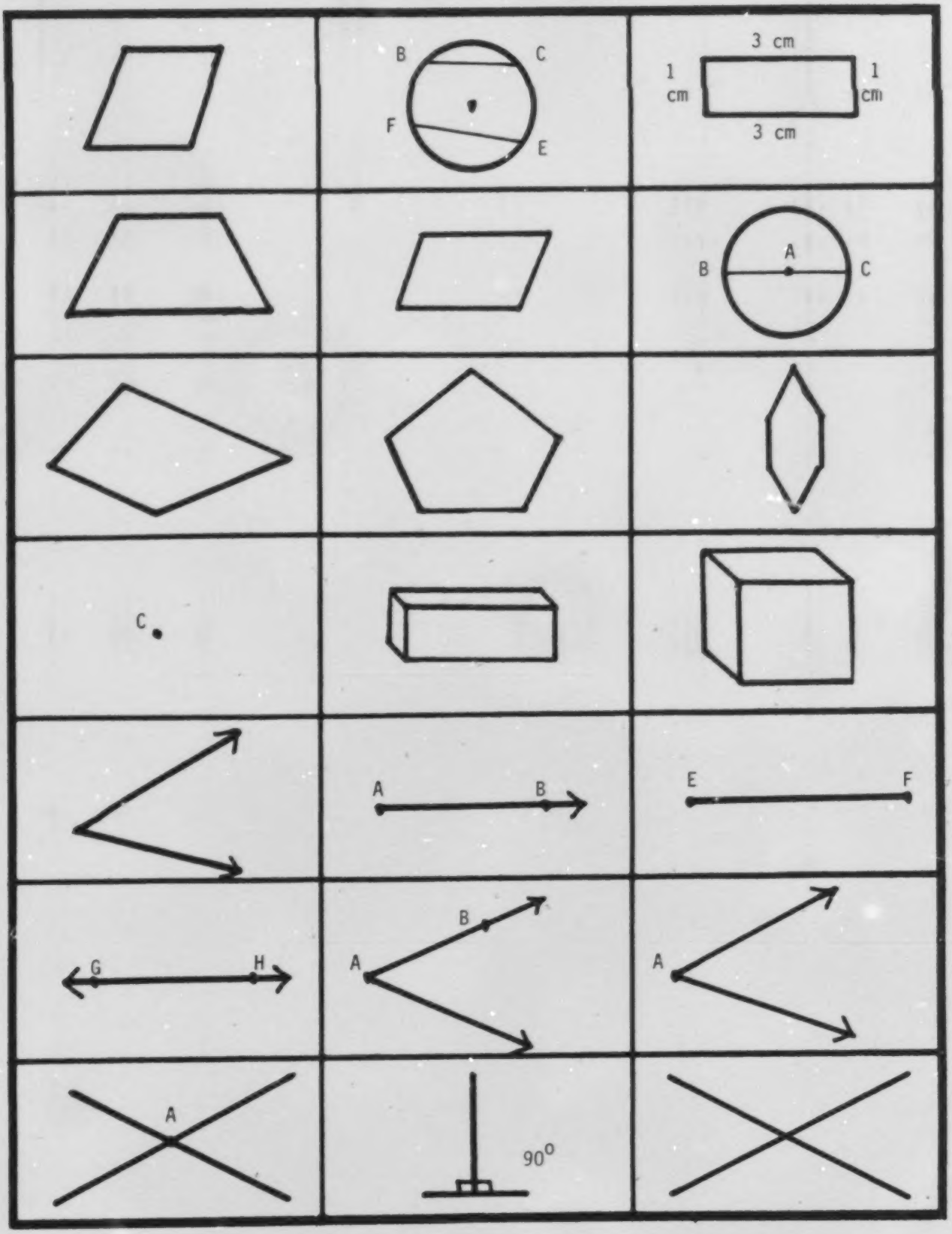
| | | |
|---|---|---|
| B-1<br>VERTEX A | B-2<br>SIDE AB | B-3<br>LINE GH |
| B-4<br>INTERSECTION | B-5<br>COMMON POINT A | I-1<br>PARALLEL LINES |
| I-2<br>CLOSED CURVE | I-3<br>SIMPLE CLOSED CURVE | I-4<br>TRIANGLE |
| I-5<br>RECTANGLE | N-1<br>RIGHT TRIANGLE | N-2<br>POLYGON |
| N-4<br>= VOLUME OF A RECTANGULAR PRISM | N-5<br>VOLUME UNIT | G-1<br>LENGTH UNITS |
| G-2<br>AREA UNIT | G-3<br>= AREA OF A RIGHT TRIANGLE | G-4<br>= AREA OF A RECTANGLE |
| G-5<br>HAS 6 AREA UNITS | O-1<br>PERIMETER = 6 INCHES | O-2<br>CHORD BC |


G
H
A
B
A
A
1 inch
1 cm
L x W x H =
L x W =
½ x L x W =
2 cm
1 cm
1 cm
2 cm.
1
2
3
4
5
6

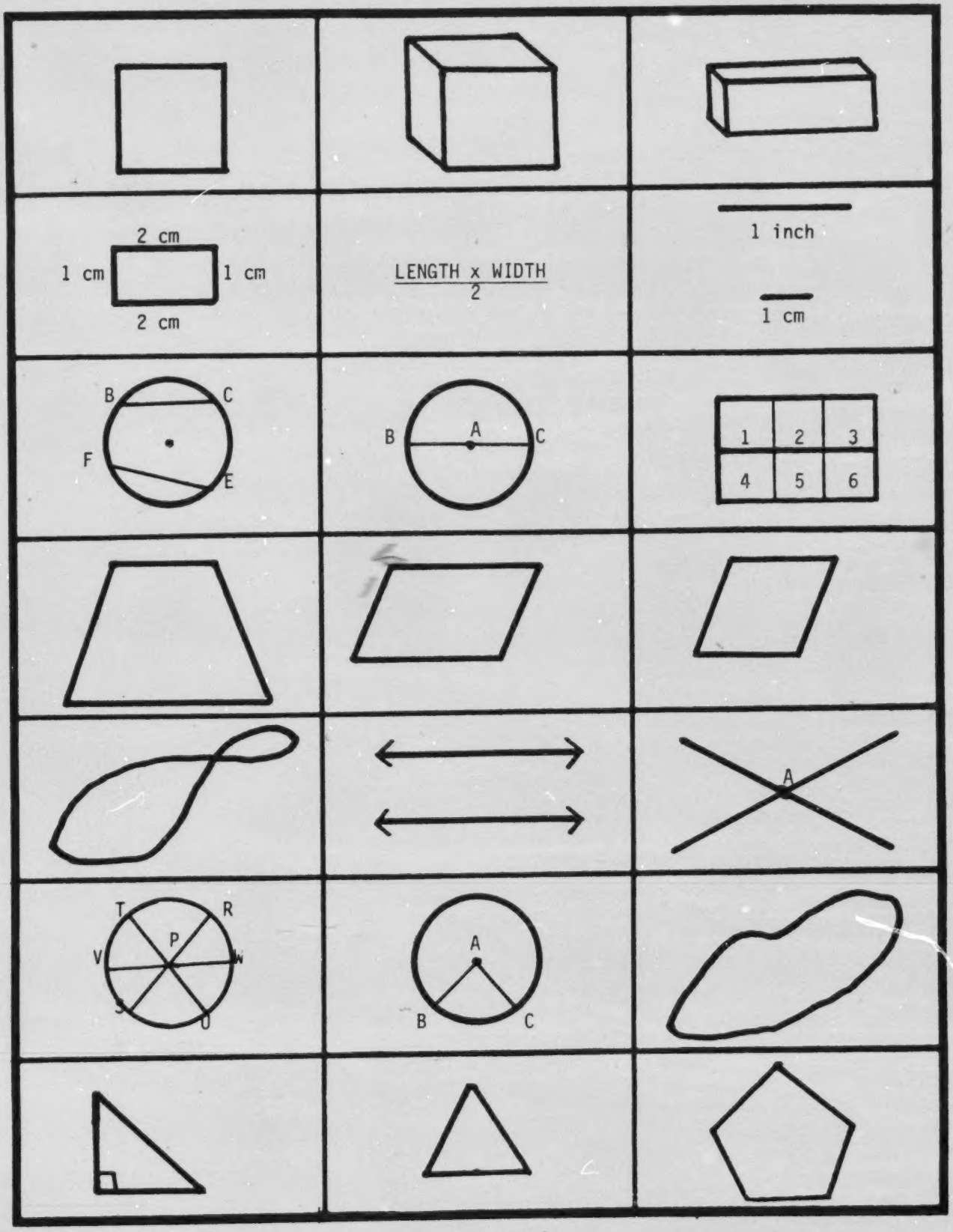
| | | |
|---|---|---|
| G-5 | O-1 | O-2 |
| LENGTH x WIDTH x HEIGHT | VOLUME UNIT | AREA UNIT |
| O-3 | O-4 | O-5 |
| LENGTH UNITS | = RIGHT TRIANGLE AREA | = RECTANGLE AREA |
| B-1 | B-2 | B-3 |
| RADII AB & AC | DIAMETERS RS TU VW | POLYGON |
| B-4 | B-5 | I-1 |
| TRIANGLE | RIGHT TRIANGLE | RECTANGLE |
| I-2 | I-3 | I-4 |
| SQUARE | DIAGONALS | SLIDE |
| I-5 | N-1 | N-2 |
| TURN | FLIP | A SYMMETRIC FIGURE |
| N-4 | N-5 | G-1 |
| LINE OF SYMMETRY | SPHERE | HAS 6 AREA UNITS |


LENGTH x WIDTH =
$\frac{L \times W}{2}$ =
1 inch
1 cm
T
R
P
V
W
S
U
A
B
C
1
2
3
4
5
6

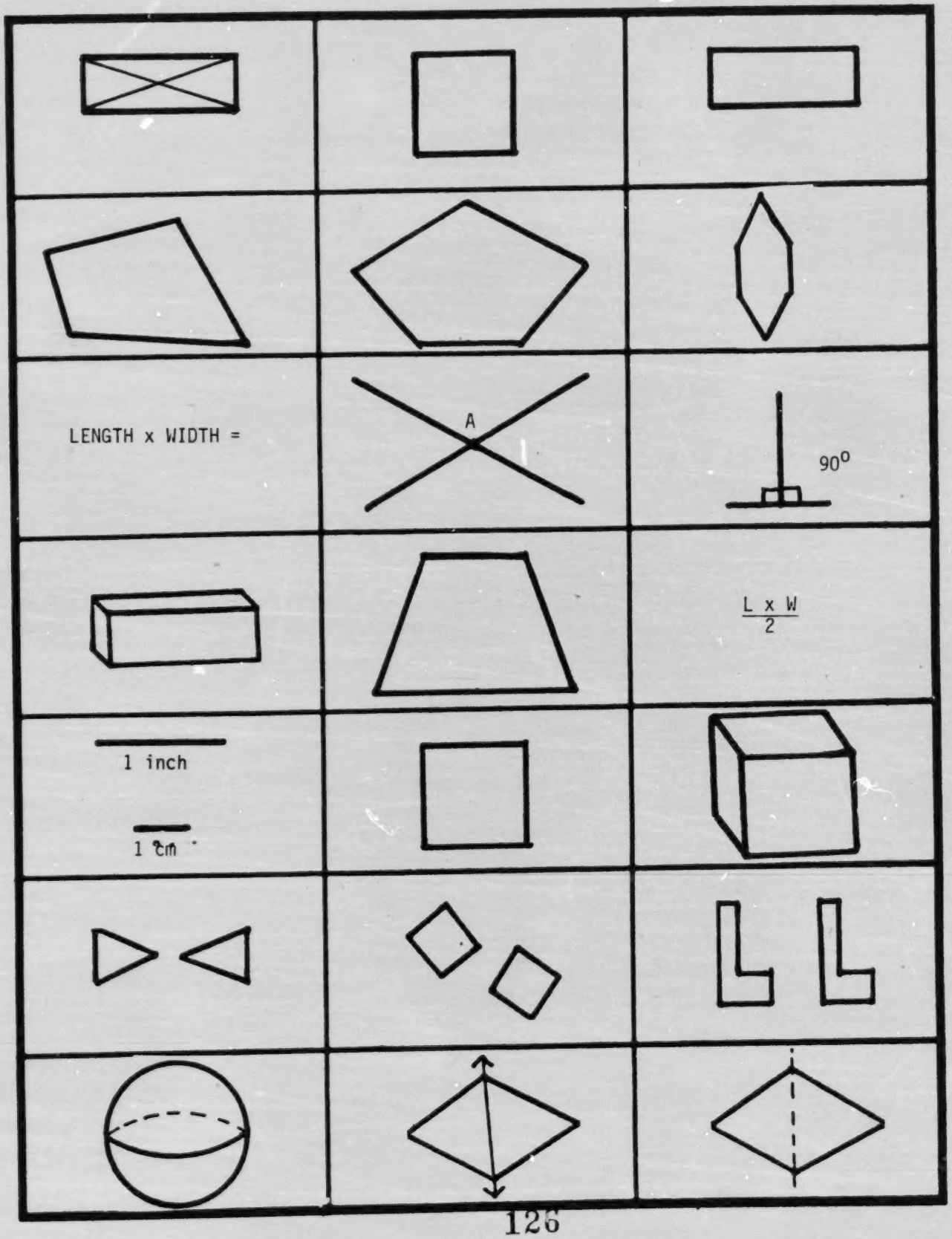
| | | |
|---|---|---|
| G-2<br>PERIMETER = 8 INCHES | G-3<br>CHORDS BC & FE | G-5<br>RHOMBUS |
| G-4<br>CHORD BC | O-1<br>PARALLELOGRAM | O-2<br>TRAPEZOID |
| O-3<br>HEXAGON | O-4<br>PENTAGON | O-5<br>QUADRILATERAL |
| B-1<br>CUBE | B-2<br>RECTANGULAR PRISM | B-3<br>POINT C |
| B-4<br>LINE SEGMENT EF | B-5<br>RAY AB | I-1<br>ANGLE |
| I-2<br>VERTEX A | I-3<br>SIDE AB | I-4<br>LINE GH |
| I-5<br>INTERSECTION | N-1<br>PERPENDICULAR LINES | N-2<br>TWO LINES INTERSECT AT ONE POINT A |


B
C
F
E
3 cm
1 cm
1 cm
3 cm
A
B
C
C
A
B
A
B
E
F
G
H
B
A
A
A
90°

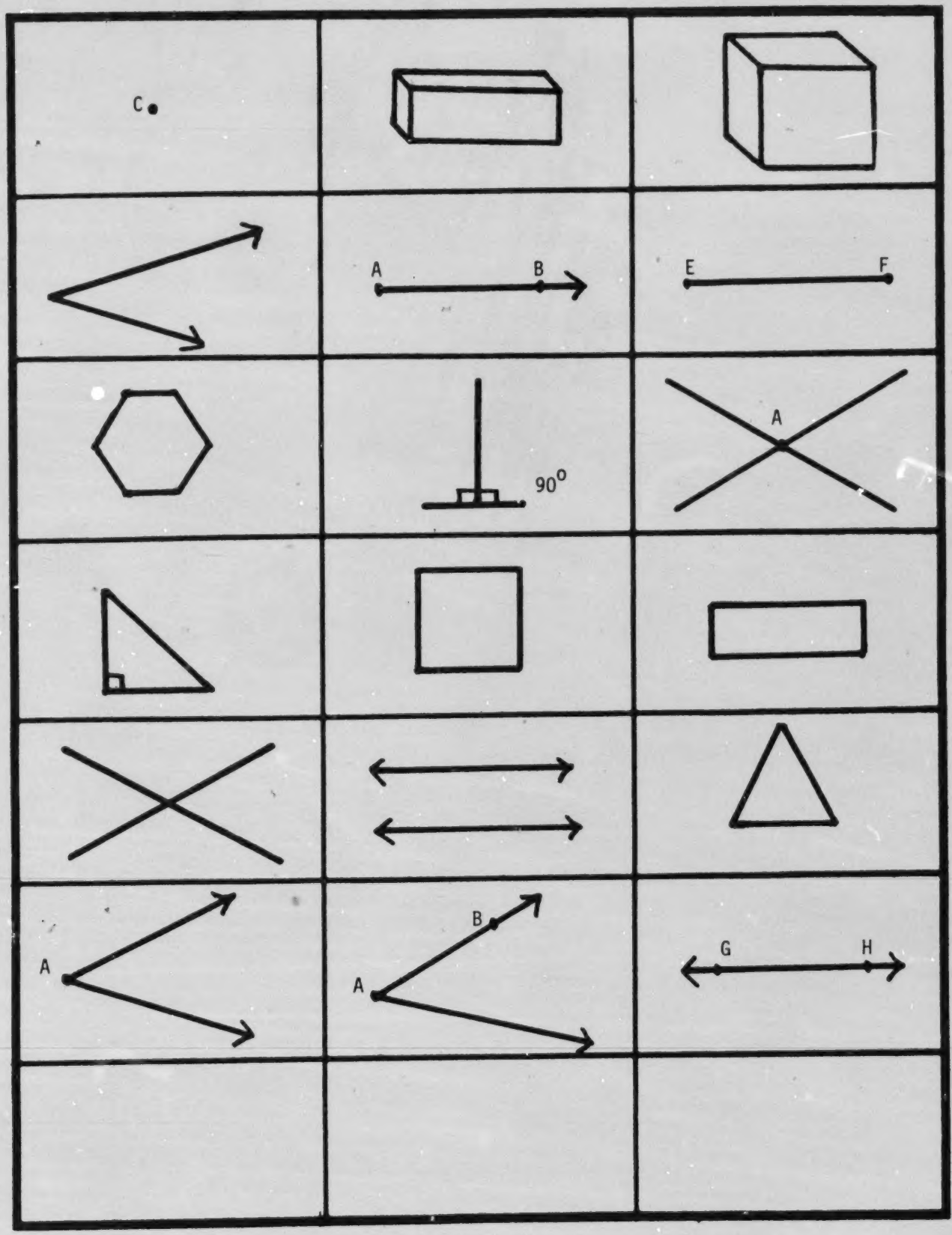
| | | |
|---|---|---|
| N-4<br>RECTANGULAR PRISM | N-5<br>CUBE | G-1<br>AREA UNIT |
| G-2<br>LENGTH UNITS | G-3<br>RIGHT TRIANGLE AREA | G-4<br>HAS 6 UNIT REGIONS |
| G-5<br>PERIMETER = 6 INCHES | O-1<br>CHORD BC | O-2<br>CHORDS BC & FE |
| O-3<br>RHOMBUS | O-4<br>PARALLELOGRAM | O-5<br>TRAPEZOID |
| B-1<br>COMMON POINT A | B-2<br>PARALLEL LINES | B-3<br>CLOSED CURVE |
| B-4<br>SIMPLE CLOSED CURVE | B-5<br>RADIUS AB & AC | I-1<br>DIAMETERS RS TU VW |
| I-2<br>POLYGON | I-3<br>TRIANGLE | I-4<br>RIGHT TRIANGLE |

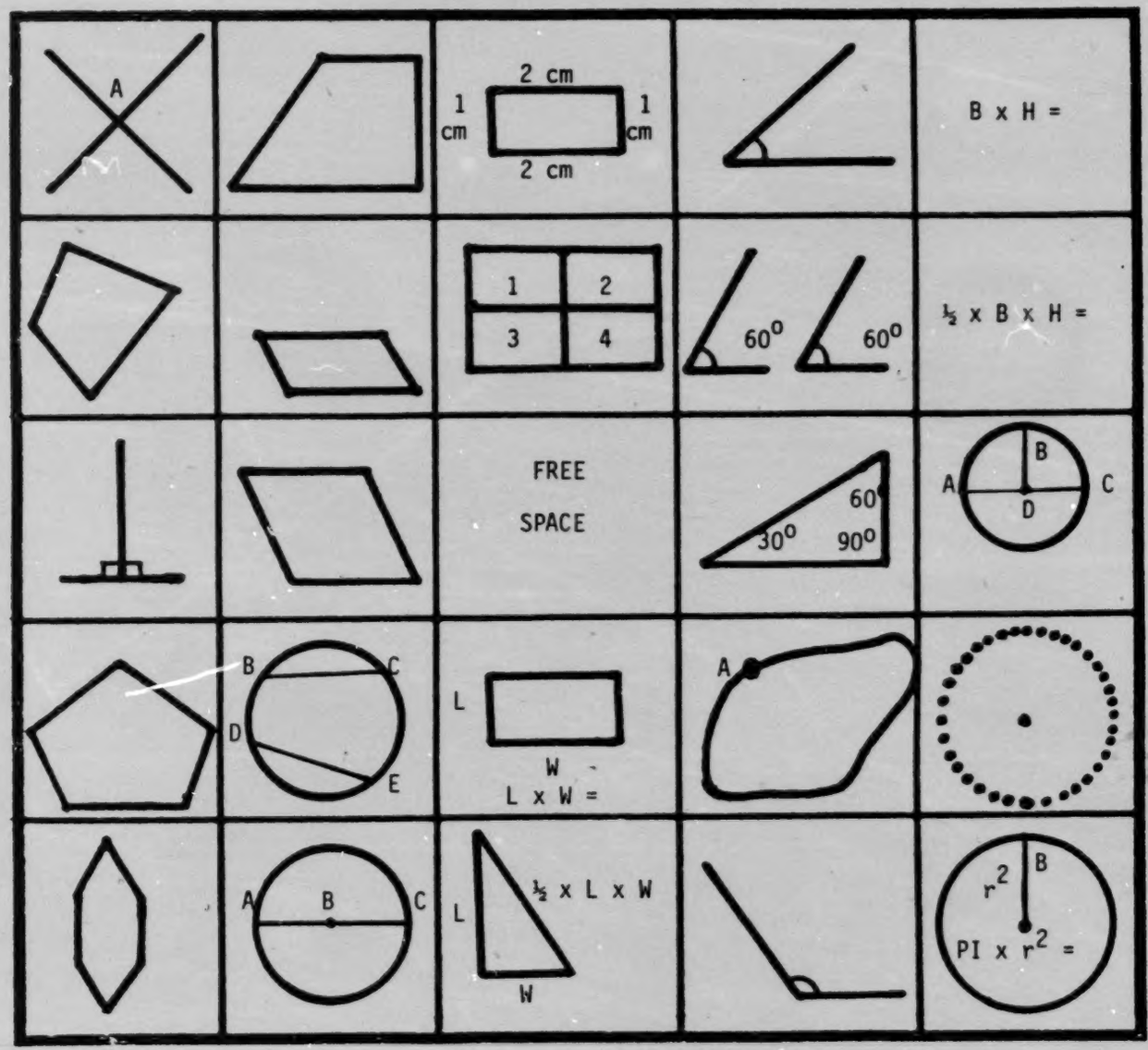

2 cm
1 cm
1 cm
2 cm
LENGTH x WIDTH
2
1 inch
1 cm
B
C
F
E
B
A
C
1
2
3
4
5
6
A
T
R
P
V
W
S
U
A
B
C

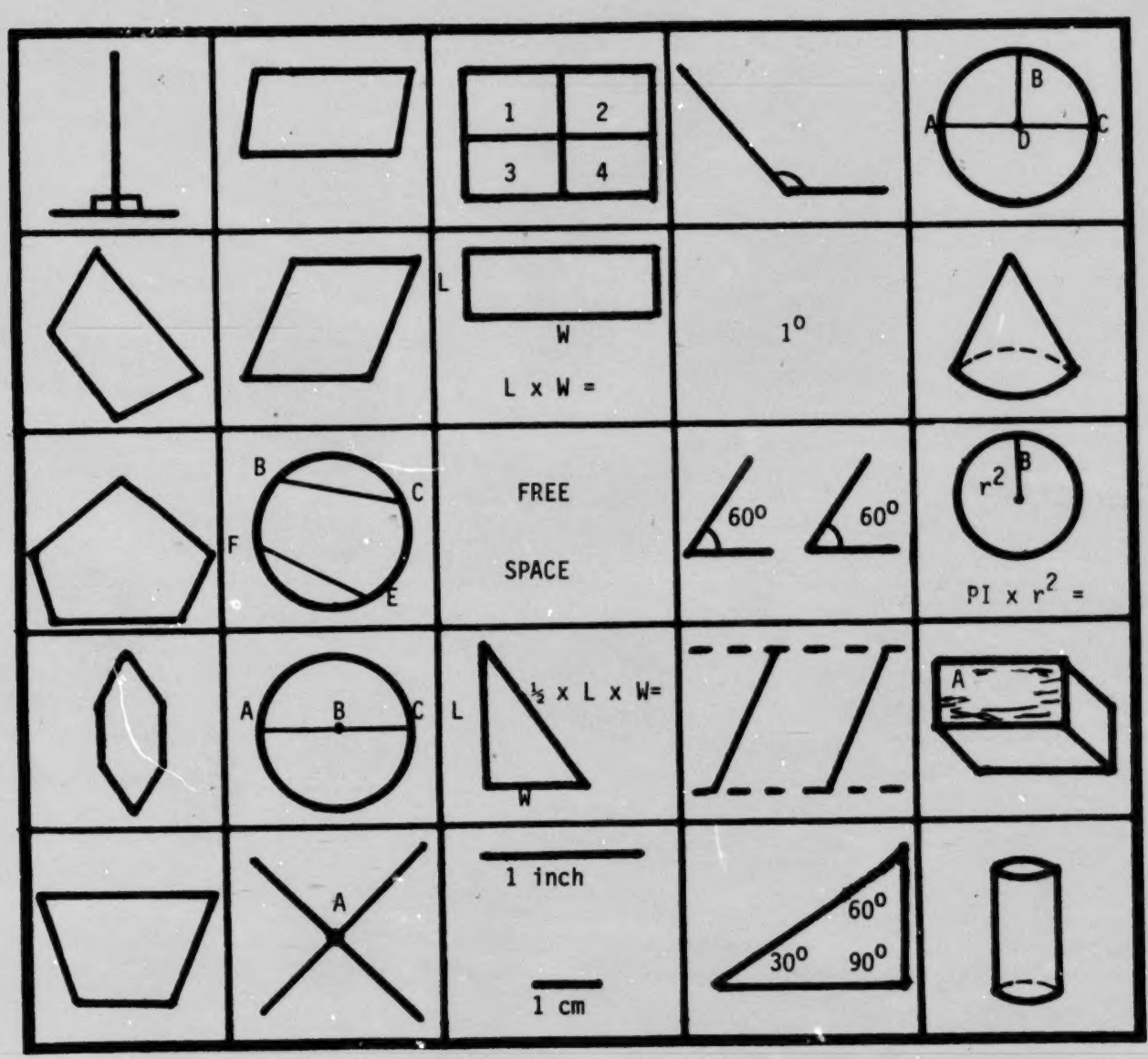
| | | |
|---|---|---|
| I-5<br>RECTANGLE | N-1<br>SQUARE | N-2<br>DIAGONALS |
| N-4<br>HEXAGON | N-5<br>PENTAGON | G-1<br>QUADRILATERAL |
| G-2<br>PERPENDICULAR LINES | G-3<br>COMMON POINT A | G-4<br>= RECTANGULAR AREA |
| G-5<br>RIGHT TRIANGLE AREA | O-1<br>TRAPEZOID | O-2<br>RECTANGULAR PRISM |
| O-3<br>CUBE | O-4<br>SQUARE | O-5<br>LENGTH UNITS |
| B-1<br>SLIDE | B-2<br>TURN | B-3<br>FLIP |
| B-4<br>A SYMMETRIC FIGURE | B-5<br>A LINE OF SYMMETRY | I-1<br>SPHERE |


LENGTH x WIDTH =
A
90°
L x W
2
1 inch
1 cm

| | | |
|---|---|---|
| I-2<br>CUBE | I-3<br>RECTANGULAR PRISM | I-4<br>POINT C |
| I-5<br>LINE SEGMENT EF | N-1<br>RAY AB | N-2<br>ANGLE |
| N-4<br>COMMON POINT A | N-5<br>PERPENDICULAR LINES | G-1<br>POLYGON |
| G-2<br>RECTANGLE | G-3<br>SQUARE | G-4<br>RIGHT TRIANGLE |
| G-5<br>TRIANGLE | O-1<br>PARALLEL LINES | O-2<br>INTERSECTION |
| O-3<br>LINE GH | O-4<br>SIDE AB | O-5<br>VERTEX A |


C
A
B
E
F
90°
A
A
A
B
G
H

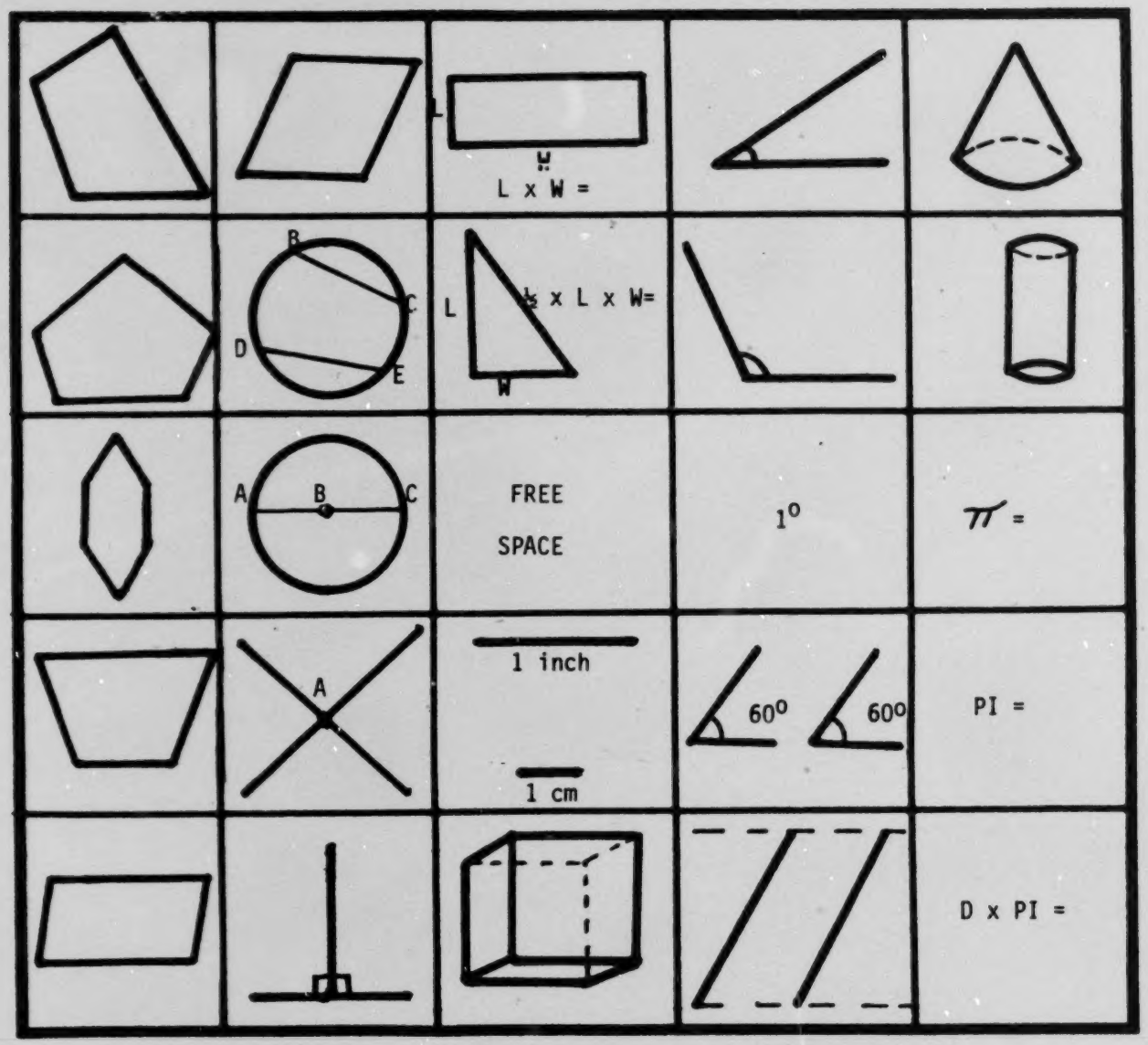

A
2 cm
1 cm
1 cm
2 cm
B x H =
1
2
3
4
60°
60°
½ x B x H =
FREE
SPACE
60°
30°
90°
B
A
C
D
B
C
D
E
L
W
L x W =
A
A
B
C
L
½ x L x W
W
r²
B
PI x r² =


1
2
3
4
B
A
C
D
L
W
L x W =
1°
B
C
F
E
FREE
SPACE
60°
60°
r²
B
PI x r² =
A
B
C
L
½ x L x W=
W
A
1 inch
1 cm
60°
30°
90°

151

131

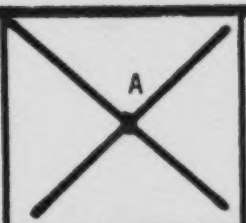
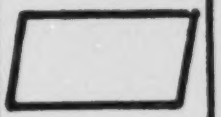
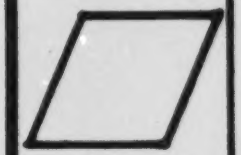
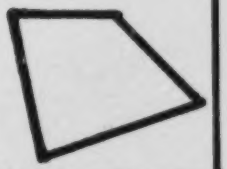
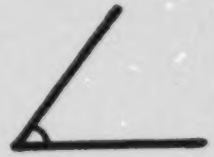
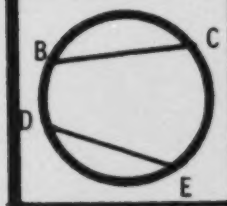
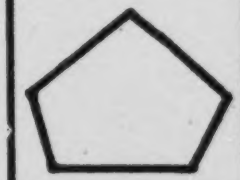
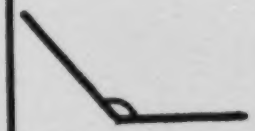
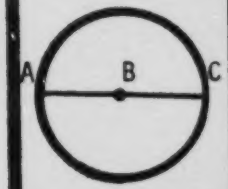
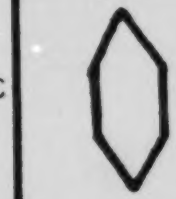
132

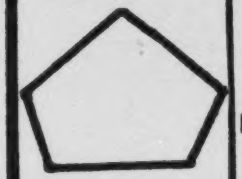
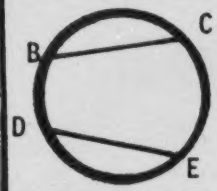
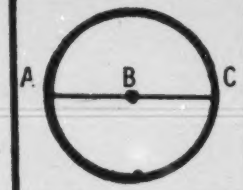
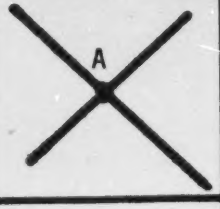
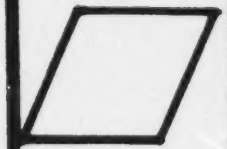
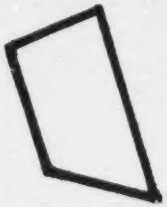
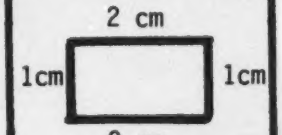
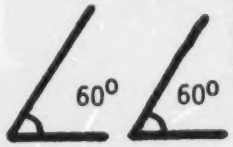


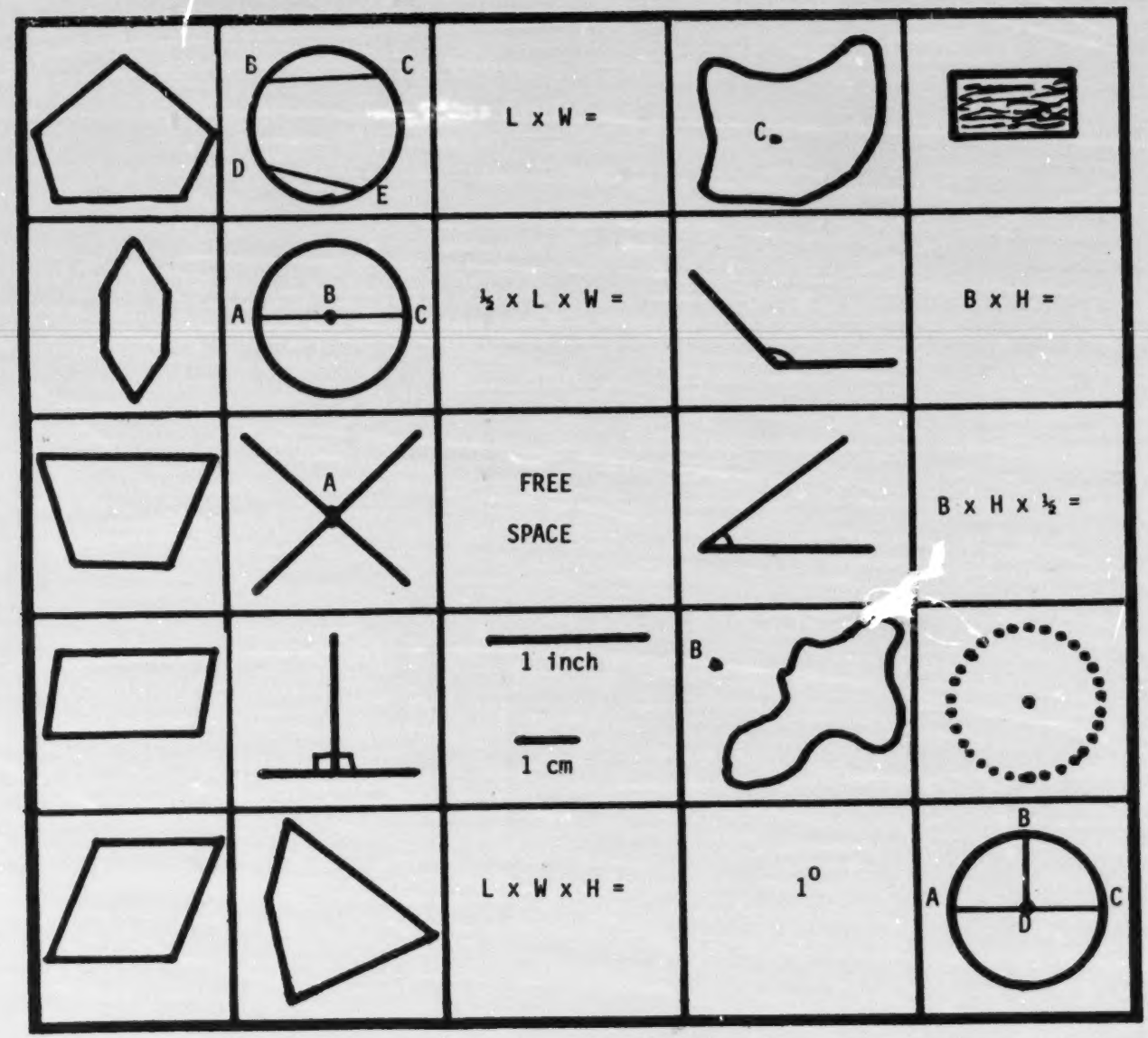

153

133

134

| | | | | |
|---|---|---|---|---|
| |  | 10 cubic units | | $\pi$ = |
|  | | 10 square centimeters | | PI x radius$^2$ = |
|  |  | FREE SPACE |  | D x $\pi$ = |
|  |  | 10 inches |  | |
|  |  | 6 unit regions | $1^o$ | PI x diameter = |

| | | | | |
|---|---|---|---|---|
|  |  | <br>square cm | | PI = |
| |  | <br>cubic cm | | PI x $r^2$ = |
| |  | FREE<br>SPACE | | base x height |
| | | <br>L x W x H | $1^o$ | |
|  |  |  |  | ½ x base x height = |


B
C
D
E
L x W =
C
A
B
C
½ x L x W =
B x H =
A
FREE
SPACE
B x H x ½ =
1 inch
1 cm
B
L x W x H =
1°
B
A
D
C

159

B-5

CHORD AC
DIAMETER AC

I-1

INTERSECTION AT ONLY ONE POINT

I-2

PERPENDICULAR LINES

I-3

QUADRILATERAL

I-4

PENTAGON

I-5

HEXAGON

N-1

= 10 VOLUME UNITS

N-2

= 10 AREA UNITS

N-4

= 10 LENGTH UNITS

N-5

= TO THE AREA OF A REGION

G-1

ONE LINE THRU TWO POINTS

G-2

INFINITE NO. OF LINES THRU ONE POINT

G-3

ACUTE ANGLE

G-4

OBTUSE ANGLE

G-5

MEASURE OF A CENTRAL ANGLE

O-1

= PI OR 3.14

O-2

= CIRCLE AREA

O-3

= CIRCUMFERENCE OF A CIRCLE

O-4

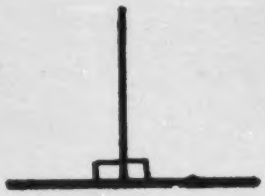
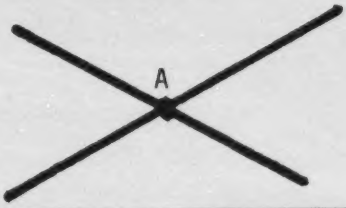
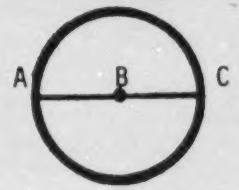
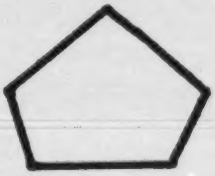
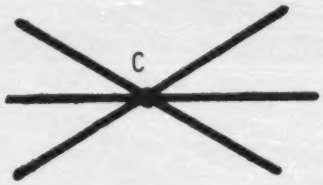
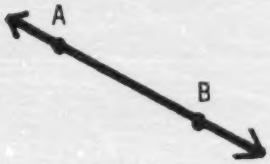
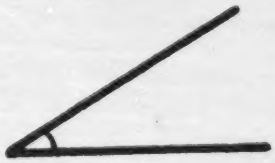
CYLINDER

O-5

= CIRCUMFERENCE

B-1

QUADRILATERAL

| | | |
|---|---|---|
|  |  |  |
| |  | |
| 10 inches | 10 square centimeters | 10 cubic units |
|  |  | 6 unit regions |
| $1^{o}$ | |  |
| PI x diameter = | PI x radius$^{2}$ = | = |
| | D x PI = | |

O-1

DIAMETER TWICE THE RADIUS

O-2

CONE

O-3

= CIRCLE AREA

O-4

FACE OF A RECTANGLE

O-5

CYLINDER

B-1

TWO LINES INTERSECT AT ONE POINT

B-2

QUADRILATERAL

B-3

PERPENDICULAR LINES

B-4

PENTAGON

B-5

HEXAGON

I-1

TRAPEZOID

I-2

PARALLOGRAM

I-3

RHOMBUS

I-4

CHORDS BC AND DE

I-5

CHORD AC

N-1

PERIMETER = 6"

N-2

= 4 UNIT REGIONS

N-4

= RECTANGLE AREA

N-5

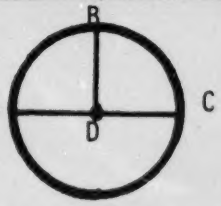
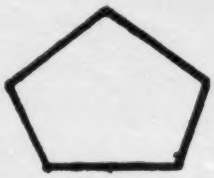
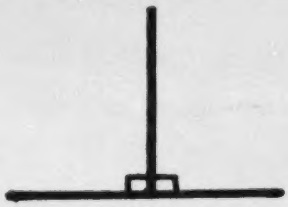
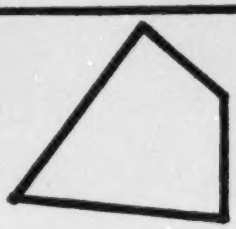
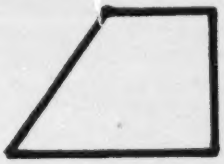
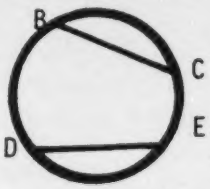
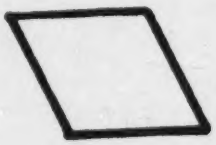
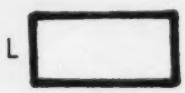
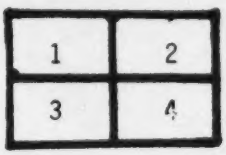
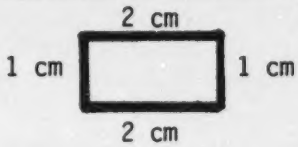
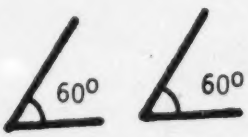
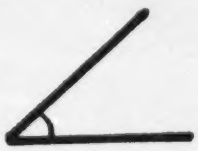
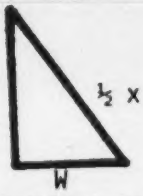
= RIGHT TRIANGLE AREA

G-1

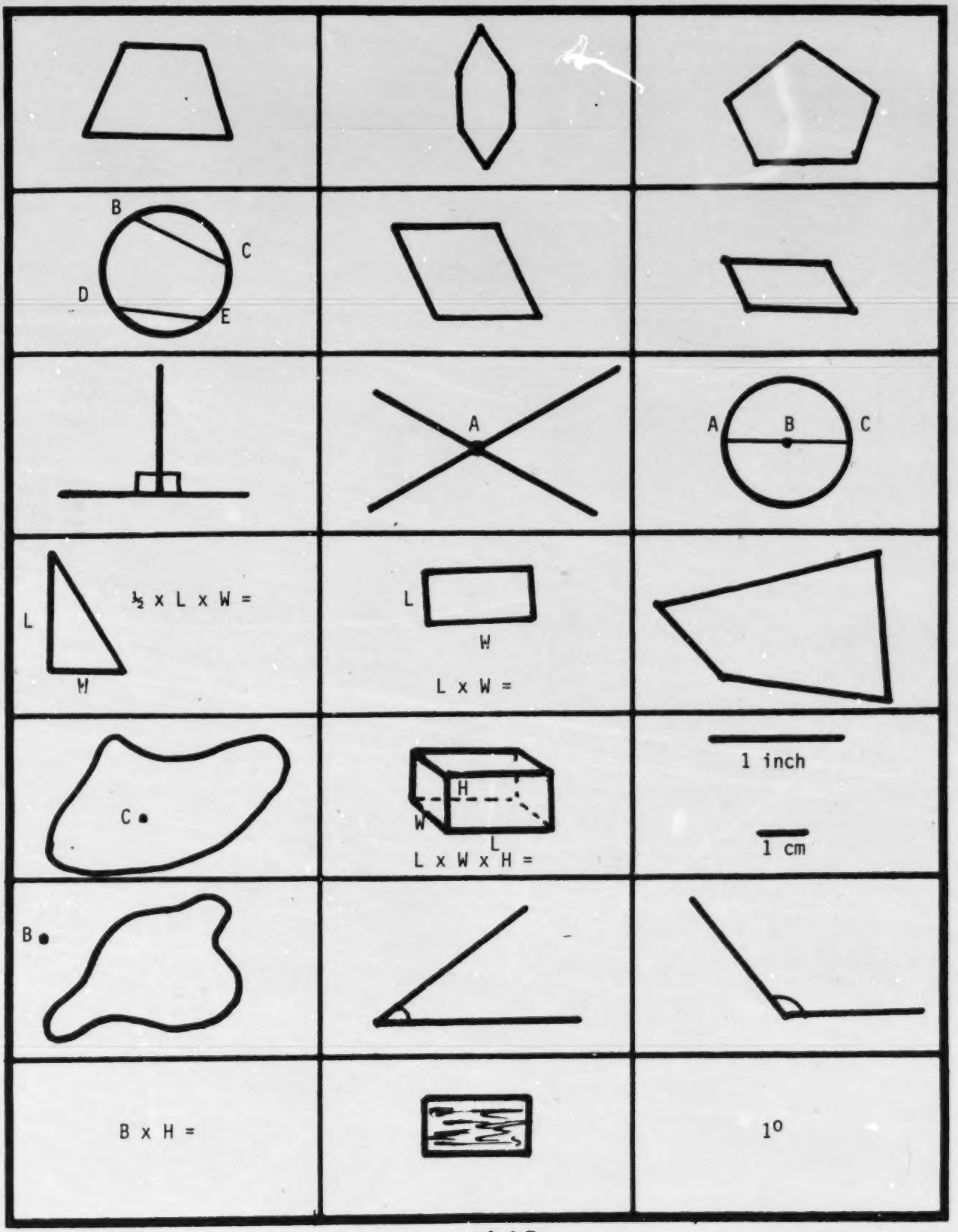
ACUTE ANGLE

G-2

CONGRUENT ANGLES

| | | |
|---|---|---|
| PI x $r^2$ = | |  |
| | | |
|  |  |  |
| |  | |
| |  |  |
|  <br>L x W = |  |  |
|  |  |  <br>½ x L x W = |

| | | |
|---|---|---|
| B-1<br>PENTAGON | B-2<br>HEXAGON | B-3<br>TRAPEZOID |
| B-4<br>PARALLOGRAM | B-5<br>RHOMBUS | I-1<br>CHORDS BC AND DE |
| I-2<br>CHORD AC<br>DIAMETER AC | I-3<br>INTERSECTION AT ONE POINT | I-4<br>PERPENDICULAR |
| I-5<br>QUADRILATERAL | N-1<br>= RECTANGLE AREA | N-2<br>= RIGHT TRIANGLE AREA |
| N-4<br>LENGTH UNITS | N-5<br>= VOLUME OF RECTANGULAR PRISM | G-1<br>C IS IN THE INTERIOR |
| G-2<br>OBTUSE ANGLE | G-3<br>ACUTE ANGLE | G-4<br>B IS IN THE EXTERIOR |
| G-5<br>IS THE MEASURE OF A CENTRAL ANGLE | O-1<br>THE INTERIOR IS THE REGION | O-2<br>= PARALLELOGRAM AREA |


B
C
D
E
A
A
B
C
L
W
½ x L x W =
L
W
L x W =
C
H
W
L
L x W x H =
1 inch
1 cm
B
B x H =
1°

B-2

PENTAGON

B-3

HEXAGON

B-4

TRAPEZOID

B-5

PARALLELOGRAM

I-1

RHOMBUS

I-2

CHORDS BC, DE

I-3

CHORD AC
DIAMETER AC

I-4

INTERSECTION AT ONLY ONE POINT

I-5

PERPENDICULAR LINES

N-1

= RECTANGLE AREA

N-2

= RIGHT TRIANGLE AREA

N-4

LENGTH UNITS

N-5

VOLUME UNIT

G-1

ACUTE ANGLE

G-2

OBTUSE

G-3

MEASURE OF A CENTRAL ANGLE

G-4

CONGRUENT ANGLES

G-5

TWO LINES IN THE SAME PLANE WHICH DO NOT INTERSECT

PARALLEL LINES

O-1

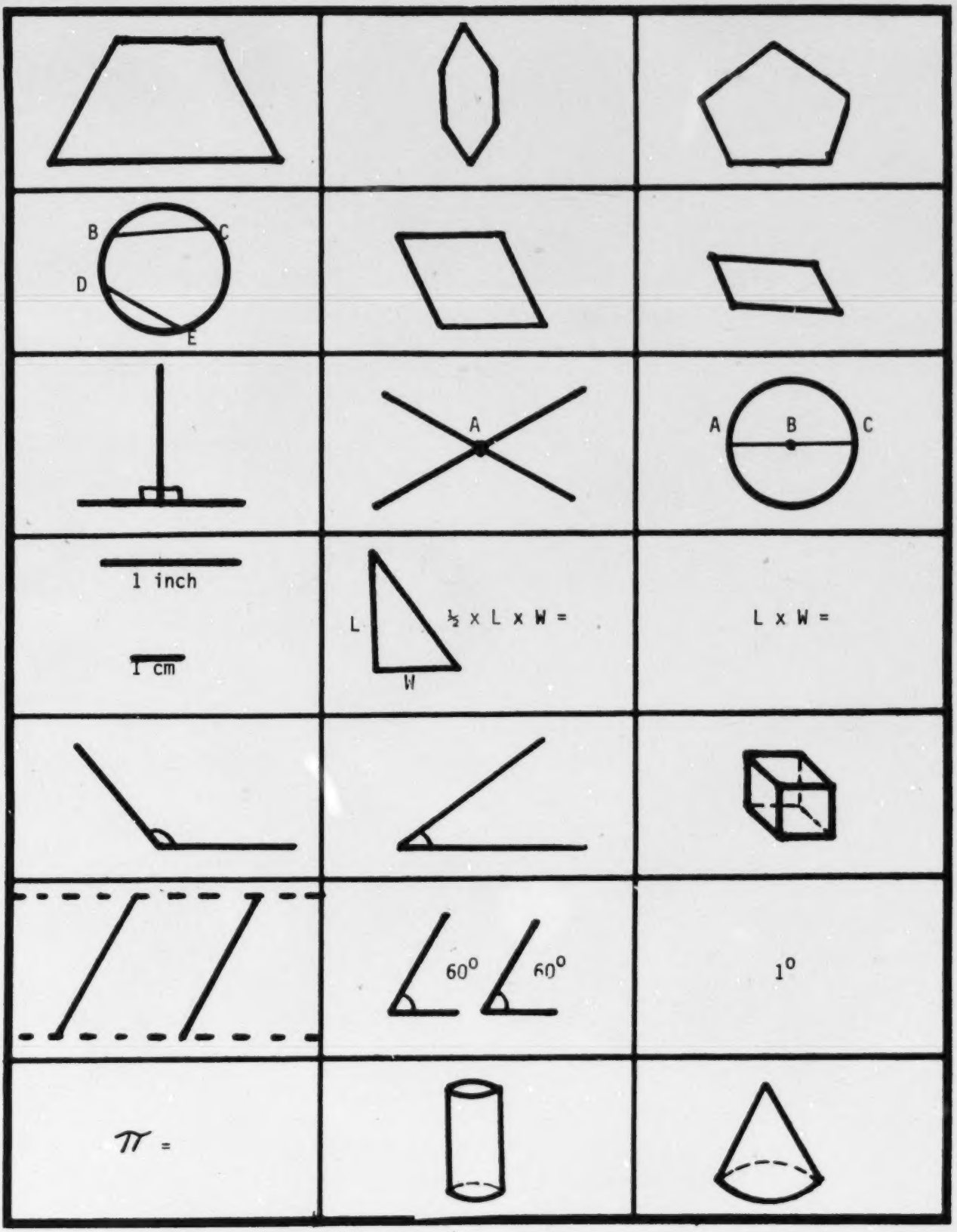
CONE

O-2

CYLINDER

O-3

= 3.14 OR PI


B
C
D
E
A
A
B
C
1 inch
1 cm
L
½ x L x W =
W
L x W =
60°
60°
1°
π =

O-3

= TRIANGLE AREA

O-4

CIRCLE - SET OF POINTS

O-5

DIAMETER TWICE THE RADIUS

N-1

IS AN AREA UNIT

N-2

IS A VOLUME UNIT

N-4

= VOLUME OF A RECTANGULAR PRISM

N-5

PERIMETER = 6"

G-1

THRU ONE POINT AN INFINITE NO. OF LINES

G-2

ACUTE ANGLE

G-3

OBTUSE ANGLE

G-4

MEASURE OF A CENTRAL ANGLE

G-5

CONGRUENT ANGLES

O-1

= 3.14

O-2

= CIRCLE AREA

O-3

= PARALLELOGRAM AREA

O-4

CONE

O-5

= TRIANGLE AREA

B-1

TRAPEZOID

B-2

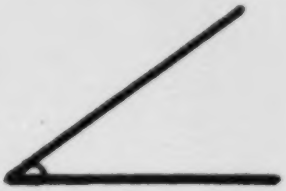
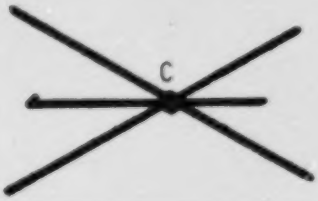
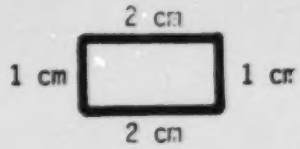
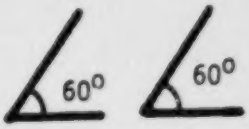
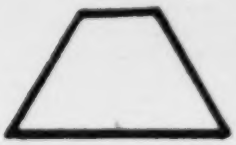
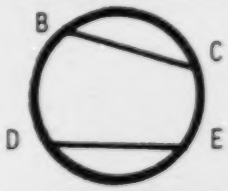
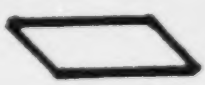
PARALLELOGRAM

B-3

RHOMBUS

B-4

CHORDS BC AND DE

| | | |
|---|---|---|
| | | ½ base x height = |
| L x W x H = | cubic cm | square cm |
|  |  |  |
|  | $1^{o}$ | |
| base x height = | | PI = |
|  | B x H x ½ = | |
|  | |  |

O-4

= 3.14

O-5

= CIRCUMFERENCE OF CIRCLE

B-1

PERPENDICULAR LINES

B-2

QUADRILATERAL

B-3

PENTAGON

B-4

HEXAGON

B-5

TRAPEZOID

I-1

PARALLELOGRAM

I-2

RHOMBUS

I-3

CHORD BC AND EF

I-4

CHORD AC
DIAMETER AC

I-5

TWO LINES INTERSECT
AT ONE POINT

N-1

= 4 UNIT REGIONS

N-4

RIGHT TRIANGLE AREA

N-2

RECTANGLE AREA

N-5

LENGTH UNITS

G-1

OBTUSE ANGLE

G-2

MEASURE OF A CENTRAL
ANGLE

G-2

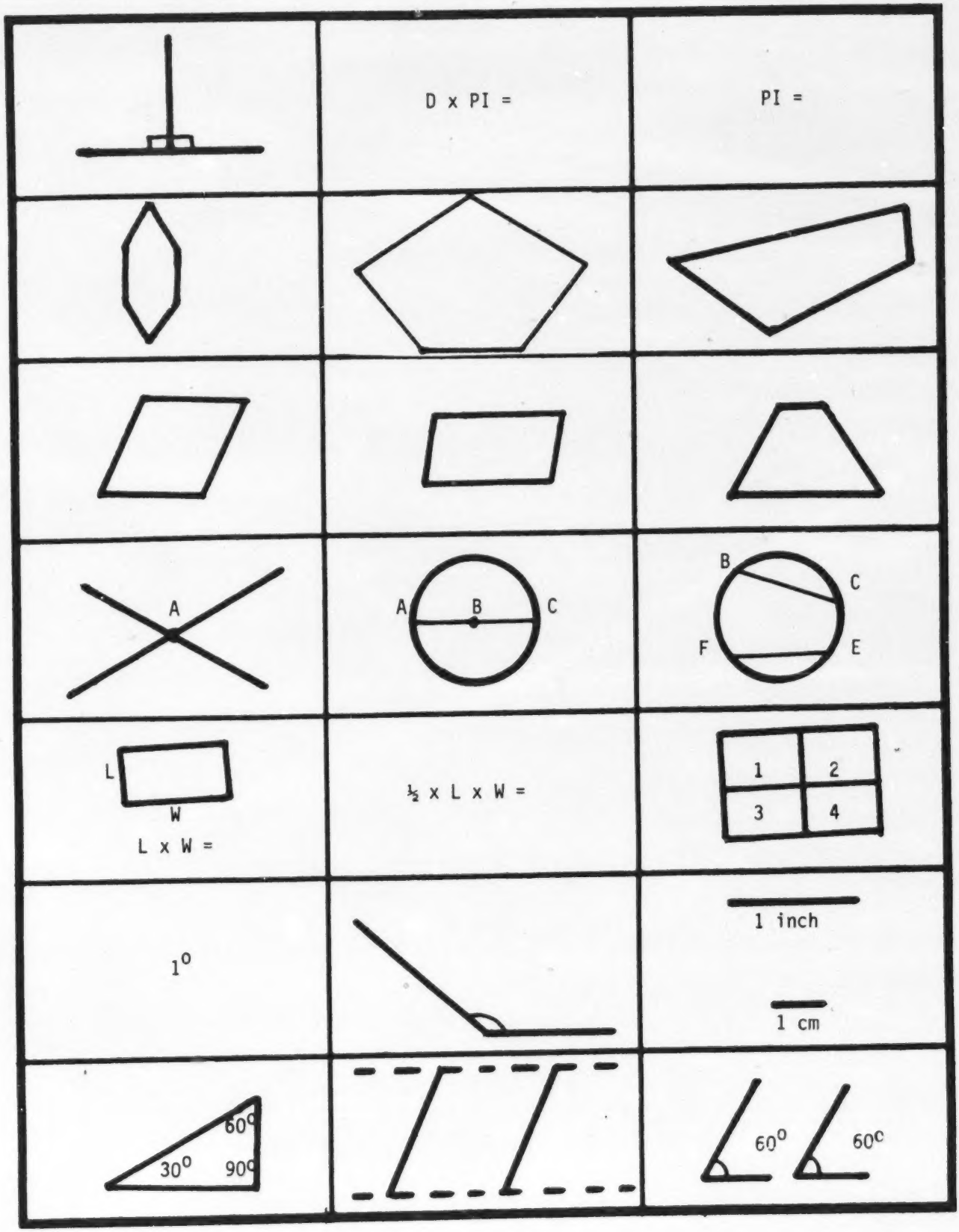
CONGRUENT ANGLES

G-4

TWO LINES IN THE SAME
PLANT WHICH DO NOT INTERSECT

G-5

ANGLES OF A TRIANGLE
= $180^{o}$


D x PI =
PI =
A
A
B
C
B
C
F
E
L
W
L x W =
½ x L x W =
1
2
3
4
1°
1 inch
1 cm
60°
30°
90°
60°
60°

G-3

ANGLES OF A TRIANGLE
= $180^{o}$

G-4

POINT ON THE CURVE

G-5

OBTUSE ANGLE

O-1

= PARALLELOGRAM AREA

O-2

= TRIANGLE AREA

O-3

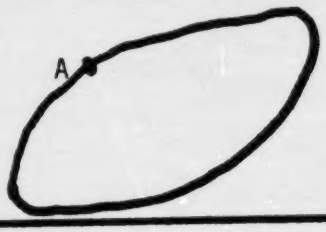
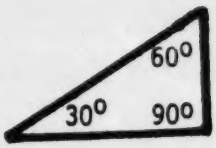
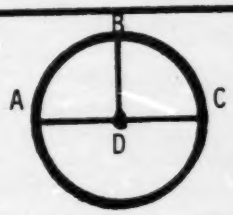
DIAMETER IS TWICE THE
RADIUS

O-4

CIRCLE IS MADE UP OF A SET
OF POINTS ALL THE SAME
DISTANCE FROM THE CENTER

O-5

= CIRCLE AREA

| | | |
|---|---|---|
| |  |  |
|  | $\frac{1}{2} \times B \times H =$ | $B \times H =$ |
| | $PI \times r^2 =$ | |
| | | |
| | | |
| | | |
| | | |

Geometric Maze Puzzle

This puzzle contains many geometric terms. The student must find the words either horizontally, diagonally, or vertically. All the words in the list are used, but only once. The word should be circled and then checked off at the bottom so that the student does not look for the same word twice. This maze is to help studnets become familiar with the many geometric terms.

Materials for Flip, Turn and Slide

An instruction sheet for these concepts is included with three sets of two congruent figures. These are designed to be used together.

Tan-o-gram Puzzles

There are four puzzles which include a circular, triangular, rectangular and square puzzle. These are quite difficult and can be used after the concepts of circle, triangle, rectangle and square are familiar to the student. The student can also make his own tan-o-gram puzzles.

# GEOMETRIC MAZE PUZZLE

| Z | T | A | X | R | O | T | C | A | R | T | O | R | P | L | N | B | W | E | P | R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Y | R | T | E | M | M | Y | S | N | E | C | A | F | E | I | O | T | N | L | G | I |
| T | I | E | T | U | C | A | V | G | R | C | O | Y | R | N | G | C | I | G | L | G |
| N | A | L | C | N | R | Y | A | L | D | H | J | N | P | E | Y | E | K | N | O | H |
| E | N | C | W | T | R | A | P | E | Z | O | I | D | E | S | L | S | L | A | L | T |
| U | G | R | Q | F | A | R | R | E | M | R | E | E | N | E | O | R | A | L | M | T |
| R | L | I | N | E | D | N | I | V | S | D | R | E | D | G | P | E | R | A | A | R |
| G | E | C | D | I | I | O | G | R | Y | P | E | R | I | M | E | T | E | R | R | I |
| N | R | U | T | J | U | G | H | U | S | D | H | G | C | E | L | N | T | T | G | A |
| O | S | E | D | I | S | A | T | C | L | I | P | E | U | N | G | I | A | N | O | N |
| C | R | A | E | I | O | X | U | D | E | A | S | D | L | T | N | N | L | E | L | G |
| X | E | T | R | E | V | E | B | E | L | G | R | C | A | D | T | O | I | C | E | L |
| F | D | R | O | H | C | H | G | S | L | O | O | P | R | H | C | I | R | J | L | E |
| T | N | I | O | P | I | L | F | O | A | N | C | B | R | L | E | G | D | K | L | E |
| D | I | A | M | E | T | E | R | L | R | A | T | U | T | I | R | E | A | M | A | D |
| Q | L | E | R | A | U | Q | S | C | A | L | P | I | B | U | S | R | U | N | R | I |
| R | Y | N | O | G | A | T | N | E | P | S | T | V | N | E | S | M | Q | W | A | L |
| X | C | I | R | C | U | M | F | E | R | E | N | C | E | U | A | E | R | A | E | S |

Find these geometric terms in the puzzle above:

Acute
Angle
Area
Central Angle
Chord
Circle
Circumference
Closed Curve
Cone
Congruent
Cube
Cylinder
Degree
Diagonal
Diameter
Face
Flip
Hexagon
Intersect
Line
Line Segment
Obtuse
Parallel
Parallelogram
Pentagon
Perimeter
Perpendicular
Point
Polygon
Protractor
Quadrilateral
Radius
Ray
Rectangle
Rectangular Prism
Region
Right Triangle
Sides
Slide
Sphere
Square
Symmetry
Trapezoid
Triangle
Turn
Unit
Vertex



GOOD LUCK!

# MATERIALS FOR FLIP, TURN AND SLIDE

Materials:

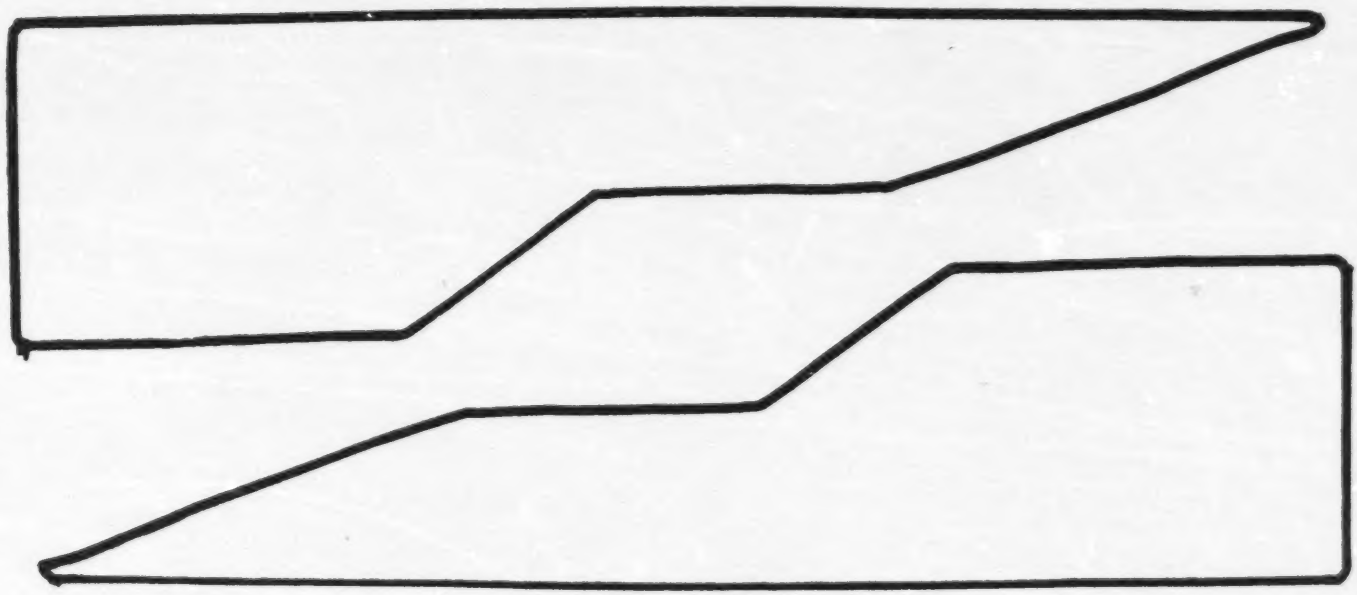
three sets of two congruent figures

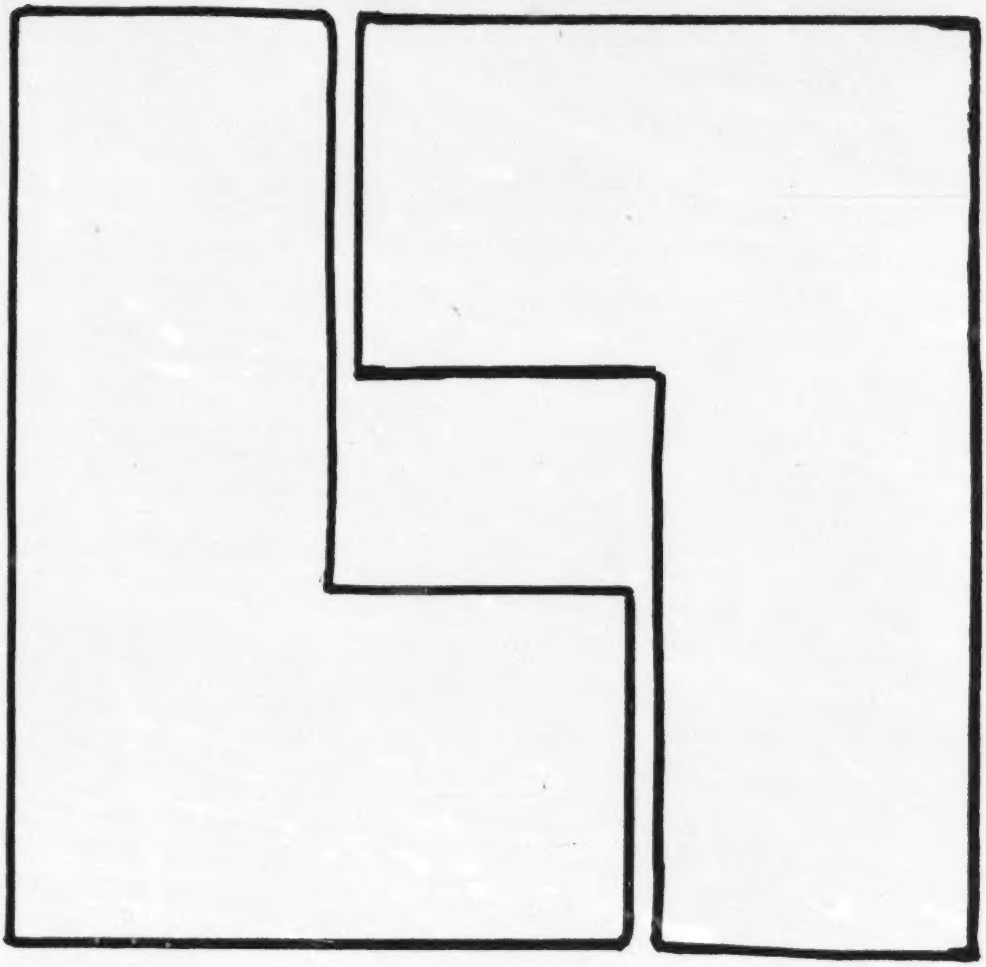
Directions:

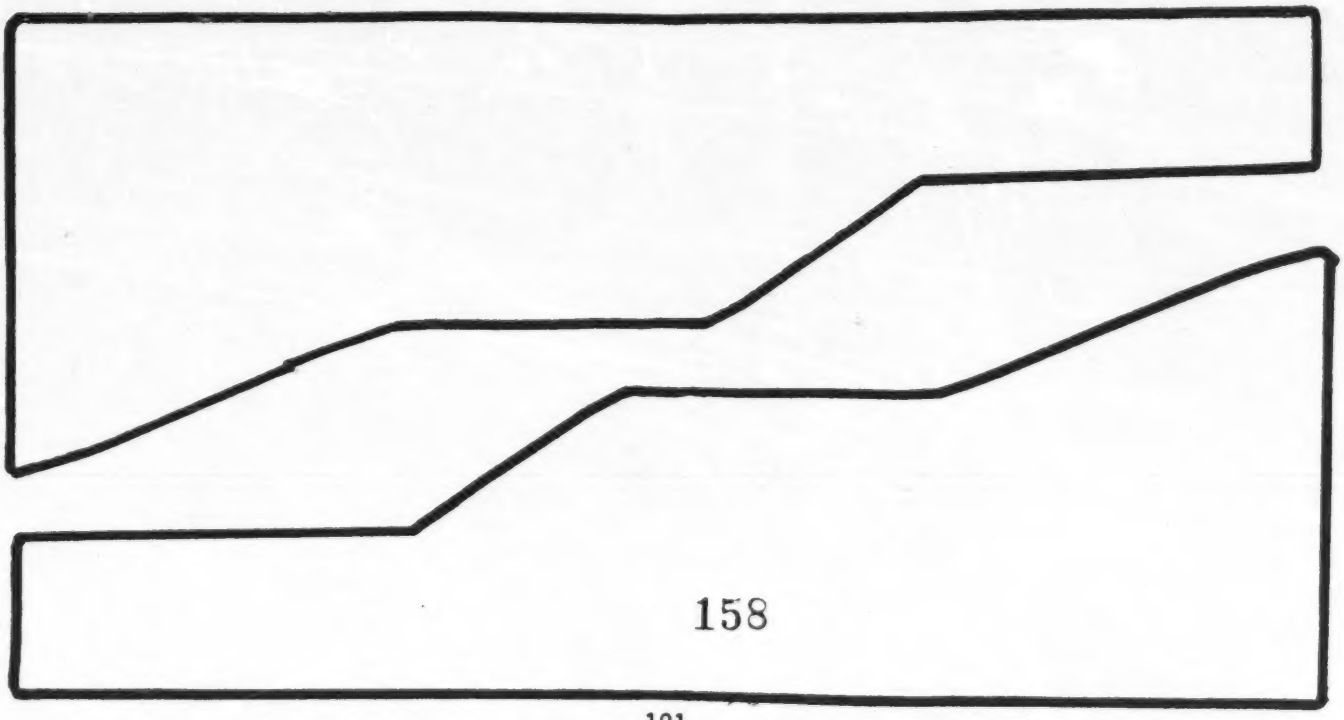
Using your vocabulary sheet find out what a flip, a turn and a slide are. Cut out the figures. Then demonstrate how each figure would move if it were flipped, turned or slid.

Optional:

Make your own set of congruent figures and show a flip, a turn and a slide. Draw a flip, turn and slide on a piece of paper. Have other students guess which is a flip, turn or slide.







158

# TAN-O-GRAM PUZZLES

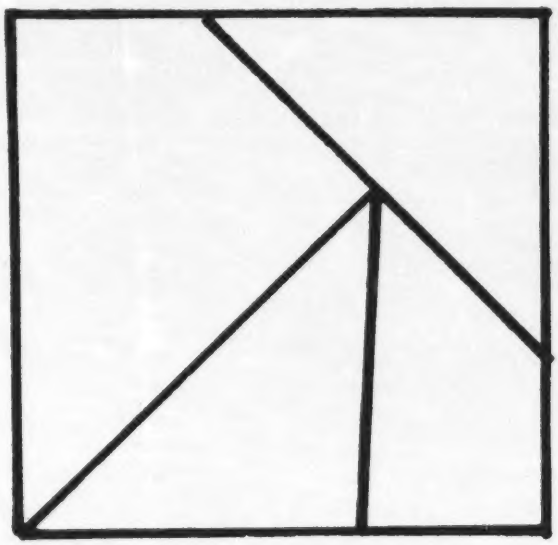
Directions:

Cut along the black lines. Then take the pieces and form the original geometric figure.

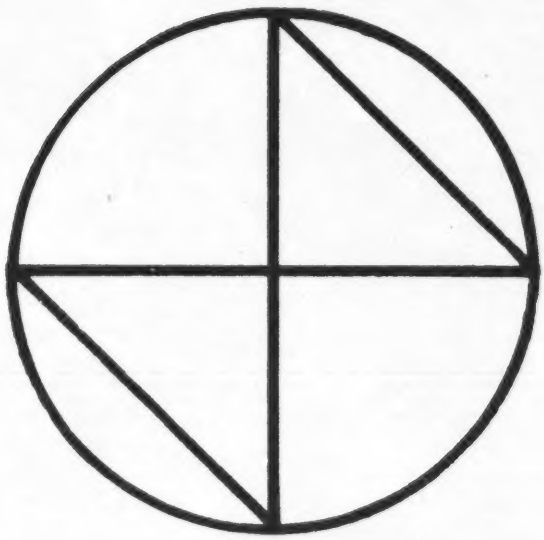
Optional:

Make your own puzzles and give them to your friends.

Square-Gram:



Circle-Gram:



# TAN-O-GRAM PUZZLES

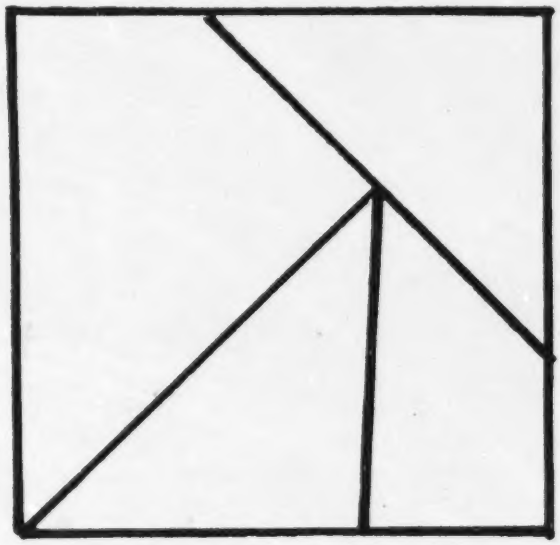
Directions:

Cut along the black lines. Then take the pieces and form the original geometric figure.

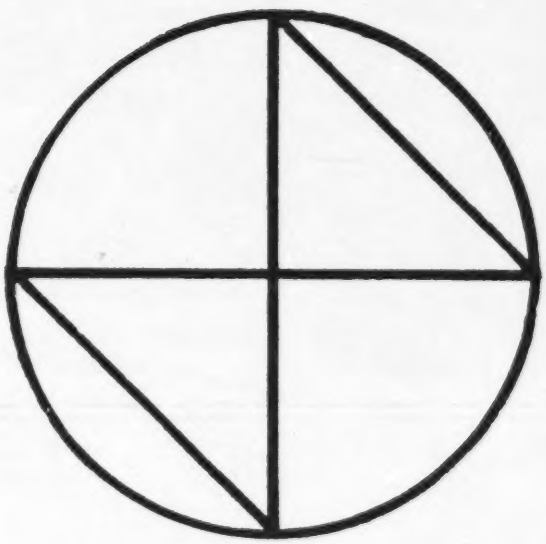
Optional:

Make your own puzzles and give them to your friends.

Square-Gram:



Circle-Gram:



# BIBLIOGRAPHY

Jungst, Dale G. Elementary Mathematics Methods: Laboratory Manual. Boston: Allyn and Bacon, Inc., 1975.

Hooten, Joseph R. and Michael L. Mahaffey. Elementary Mathematics Laboratory Experiences. Columbus, Ohio: Charles E. Merrill Publishing Co., 1973.

Smith, Seaton E. Jr. and Carl A. Backman (eds.). Games and Puzzles for Elementary and Middle School Mathematics. Washington, D.C.: The National Council of Teachers of Mathematics, Inc., 1975.

Nichols, Eugene D. et al. Holt School Mathematics. New York: Holt, Rinehart and Winston, Inc., 1974.